

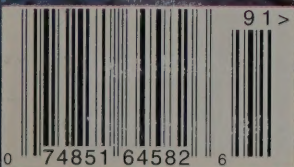
scenarios – stories of the future • Donella Meadows - **Chicken**  
Little, Cassandra and the Real Wolf • John Clute - **Futurama Retro**

# Whole Earth

Access to Tools, Ideas and Practices Spring 1999

celebrating  
soil – mother  
of all things

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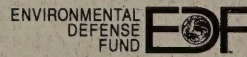
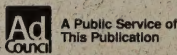
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# Whole Earth 96

Spring 1999

Dear Reader,  
This issue has been overwhelmed by friend writers. Take your time. It's much more than an airplane read. Take minimally three months.

Peter Warshall

## SPECIAL: Celebrating Soil

No anxieties, just the kaleidoscopic views. Soil as the mother of all things; soil as the strength that gives us groundedness; soil as receptive and creative producer of foods and fibers; soil as the anchor for trees; soil as pigment to decorate our bodies and canvasses; soil as purifier of dirty waters; soil as medicine; soil as building blocks for homes and roads; soil as the natural capital most undervalued on the planet; soil as the teacher of virtues and the stuff of myth.

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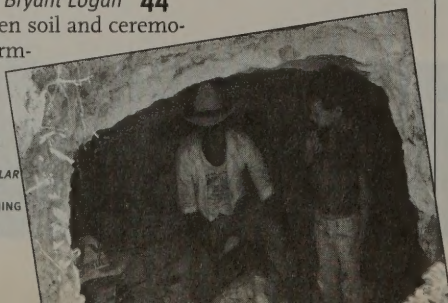
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COVER: AFGHAN SHRINES CELEBRATE NURTURING. PHOTO BY CAROLLEE PELOS FROM SPECTACULAR VERNACULAR (SEE PAGE 37). NEW GUINEA WIDOW COVERED IN CLAY, DRAPED IN MOURNING BEADS OF GRASS SEEDS. PHOTO BY MALCOLM KIRK.



## SPECIAL: Scenarios for the Future

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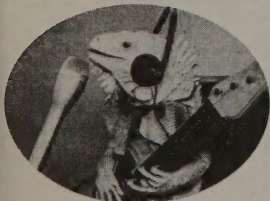
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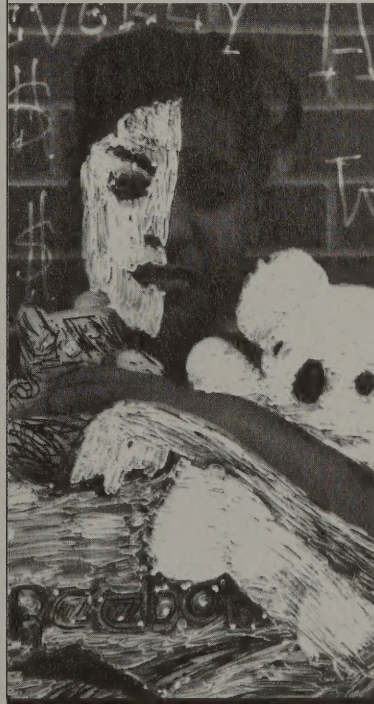
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# Whole Earth

SPRING 1999

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# Celebrating

When I first moved to California, I decided to sleep in groves of old-growth trees. I'd curl up with the roots of a redwood or shuffle my way into the litter and giant cones of sugar pines. Waking to the Ionian-column trunks of ancient beings filled the dawn with beauty, but it was the perfumed soil beneath my sleeping-bag bed that set roots in my heart. Dirt, earth, soil—whatever the moniker—became both teacher and friend.

A few years later, designing home-site sewage systems for my home town, I began to visualize the concealed beauty underfoot. From digging, rubbing, and sticking my tongue in soils, I could "see" the layers of

coastal sandy clays and the mottled ferric and lemonite lines of fluctuating water tables. Standing on certain soils, I would smile as a dirty movie passed through my mind: amoebas cruising pore spaces, engulfing bacteria, mating worms. Occasionally, in well-learned landscapes, I thought of 10,000 years of soil transformation as if it were last night's party—an exuberance of geology condensed to a friable deep loam.

Of all my loves of nature, this love of soils resonates least with my urban or even sub-rural friends. In contrast to air, water, and energy, soil seems to be the earth "element" most distant from the intellect and ethics of contemporary humans (see page 44). We still breathe air and worry about cigarette smoke, climate change, and car pollution. We still wonder, at times, where our water comes from; we purchase bottled water, guard against giardia on hikes. But soil, the ground we stand on—often plastered over with asphalt and cement—rouses minimal interest. Few can answer questions basic to most of human history:

- What names do you give the soils you live on? What texture and colors do they have?
- What soils grew your food and fiber? Which soils filtered and purified the water you drink?
- Do any virgin soils remain in your county or bioregion? Who—if anyone—cares about protecting them?
- What makes your soil landscape particular? Do special layers of soils nurture singular flowers or grasses? Do you need phosphates to grow your garden?
- What's your soil's history? How have humans changed your watershed's soils?
- What soils cause problems to your community? Clays that crack beneath house foundations?



# Soil

Silt in the rivers?  
Quicksand under a free-  
way? Slickensides?

- Are the soils healthy? Do you know of leakage from old industries or landfills? Could parts of parking lots be unearthed to make room for trees between the car slots?

Almost no Americans today know the soil that produces their food. Most food travels 1,300 to 2,000 miles before we say grace and dive in.

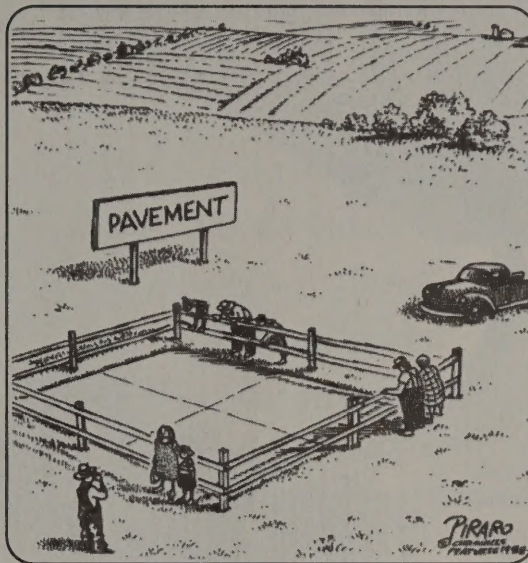
We were humbled by ethnopedologists (students of cross-cultural soil knowledge) who found indigenous farmers intimately describing their local soils with terms like fat, hot, forgiving, and weak (page 26). Soil words, common to the majority of US citizens one hundred years ago, words like friable and tilth, bring perplexed frowns today. The “soil quiz” above underscores this ignorance, a distancing that, more than any other, marks the human transition from an agricultural to an industrial/“information age” society.

Whole Earth decided to celebrate soil, to give it some badly needed exposure. The soil quiz is all the anxiety you’ll find here. We will not spend two paragraphs praising the wonders of the earth and then hammer you with forebodings about erosion, toxic subsoils, silted dams and estuaries, an asphalted nation, depleted groundwater, or poor building sites. This issue, we hope, can help to rekindle an affection for soils.

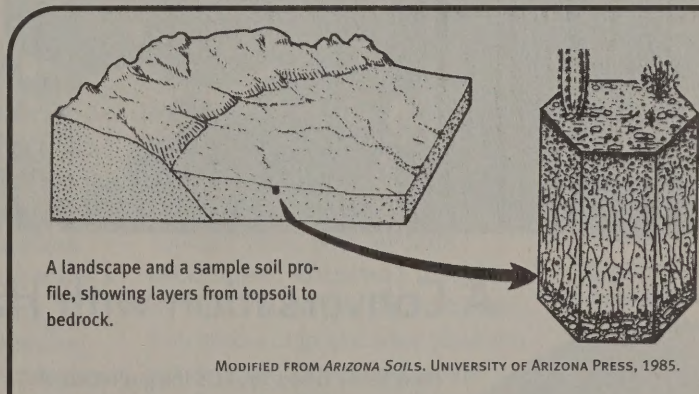
As we talked to dozens of soil lovers of many ilks, I began to feel like all seven blind men with the elephant. Our view of soil became kaleidoscopic. Construction workers, the builders of empires,

see soil as the loose material on the planet’s surface, defined by the amount of muscle it takes to move it (page 32). Some laborers have a special interest in clay for adobe and bricks (page 36). Farmers see soil

as the medium for growing plants (page 22). Natural capitalists regard soil as a capital good in the ecologic/economic system and as a “service bank” that organizes the flow of nutrient currency (page 22). Artists and doctors appreciate soil as a source of pigments and medicines (pages 39). Ecologists gawk at soil, the richest of the planet’s ecosystems and a critical link to biosphere dynamics (page 18). Certain farming societies and philosophers feel that laboring with soil nurtures humility, humaneness, hope, and responsible practice (page 25)—in short, it is the basis for a grounded future. —PW



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A landscape and a sample soil profile, showing layers from topsoil to bedrock.

MODIFIED FROM ARIZONA SOILS. UNIVERSITY OF ARIZONA PRESS, 1985.



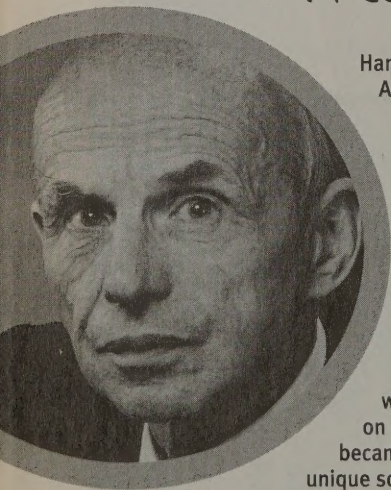
FROM ANT HOMES UNDER THE GROUND. SEE REVIEW, PAGE 30.

# My Friend, the Soil



STONE CITY, IOWA, GRANT WOOD (1930).

## A Conversation with Hans Jenny



Hans Jenny (1899-1992) is the godfather of American soil conservation and reverence. *Factors in Soil Formation* (see access, p. 9) has had the impact on ecology that Darwin and Lyell had in the nineteenth century. He created the first comprehensive model on soil's driving forces: climate, organisms, time, topography, and parent material. A native of Switzerland, Jenny (pronounced "Yenny") came to the US in 1926 as a Rockefeller Fellow. He started his work concerned with the evolution of soils, and while at the University of Missouri focused on the problems of declining soil fertility. He became the first advocate of saving virgin and unique soils in America, helping to conserve pieces of California's pygmy forest, Mt. Shasta mudflows, and the Jepson Prairie. All the soil enthusiasts we contacted for this issue (e.g., Ronald Amundson, Garrison Sposito, Wes Jackson) urged that we pay homage to his brilliance, charm, and heart. This 1984 article is reprinted with the gracious permission of the *Journal of Soil and Water Conservation*. Interviewer Kevin Stuart was, at the time, a curious graduate student at the University of Hawaii. —PW

**S**oil appeals to my senses. I like to dig in it and work it with my hands. I enjoy doing the soil texture field test with my fingers or kneading a clay soil, which is a short step from ceramics or sculpture.

Soil has a pleasant smell. I like to sit on bare, sun-drenched ground and take in the fragrance of soil. As yet, neither smell nor touch sensations have been accorded aesthetic recognition, but colors delight painters, photographers, and writers, as well as you and me.

In loess country [fine-grained silt or clay, thought to be distributed by wind], plowed fields on slopes show wide bands of attractive color gradations from dark browns to light yellows, caused by erosion of the surface soil. Warm brownish colors characterize fields and roofs in Cézanne's landscape paintings of southern France, and radiant red soils of the tropics dominate canvasses of Gauguin and Portinari. Soil profiles viewed in pits may reveal vivid color and structure patterns of layers or horizons. I have seen so many delicate shapes, forms, and colors in soil profiles that, to me, soils are beautiful.



Whenever I offer this reaction to an audience, I notice smiles and curiosity, but when I follow up with slides that depict ebony black molisols of Canada, titian-red oxisols of Hawaii, and gorgeous soil-profile paintings by such famous artists as Grant Wood of Iowa, Dubuffet of France, and Schmidt-Rottluff of Germany, the hesitancy turns into applause.

**STUART:** How would you explain the lack of aesthetic appreciation of soil on the part of many scientists?

**JENNY:** I don't know. Maybe they lacked early exposure to art appreciation. My grandfather was a wood carver, and his sons and daughters kept an interest in art. In high school I had an art teacher who took us regularly to current art exhibits in local galleries and museums. Soil-profile art is not akin to classic paintings with themes; rather, it resembles abstract art: and if you are used to thinking of soil as dirt, which is customary in our society, you are not keyed to find beauty in it.

...Confronting an exposed soil cut may be an exciting event. Soil speaks to us through the colors and sculptures of its profile, thereby revealing its personality: we acknowledge it by giving soil a name, albeit in a foreign tongue, but we don't mention our emotional involvements. In fact, our soil language is lifeless, and the soil descriptions in our publications are utterly boring to farmers, ranchers, foresters, sportsmen, and newcomers who are supposed to read them. Articulation would strengthen our feelings about the soil body. Casually and in formal lectures, we may want to talk more openly about soils and do it more enthusiastically. We may even become more interesting persons. We may gain new friends, and they might hold a positive opinion of the soil resource.

**STUART:** How important do you think soil science and soil scientists are in influencing the rest of the society's ideas about soils?

**JENNY:** Quite unimportant, I'm afraid. Our technical articles are being read by a small coterie of fellow specialists, and the leading national press ignores them completely. In its heydays of the 1930s and 1940s, the Soil Conservation Service electrified the nation and got the school children involved, but those days are over.

...soil is a natural body that deserves scientific study and contemplation, as is accorded other natural bodies, the organisms, rocks, oceans, and stars."

Some months ago the *Christian Science Monitor* published a lengthy discourse on soil deterioration, but I could not detect an echo in the city press. Perhaps as long as supermarkets are well stocked with food, the city dweller does not look beyond. It is a shame that the many excellent and interesting papers by soil scientists remain confined to library shelves. New findings by chemists, geologists, geneticists, and ecologists are regularly reported by the media, and commented upon, but the subject of soils seems to be taboo. I suspect that our intellectual isolation and our invisibility have to do with the lack of formulating exciting ideas about soils themselves and their relations to people, and the shortage of popularizing soil science writers.

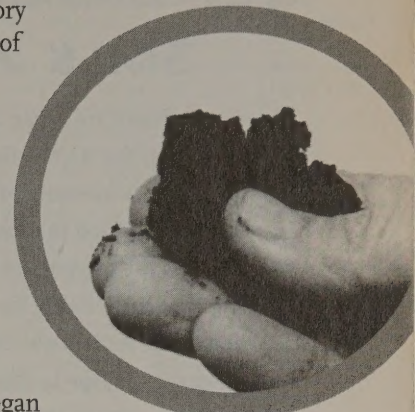
**STUART:** How would you describe the idea of soil as interpreted by the discipline of soil science?

**JENNY:** To my famous teacher G. Wiegner, soil was an object to apply known principles of colloid science and to discover new ones. He expressed little interest in the con-

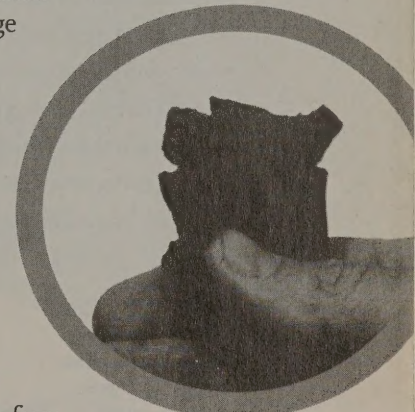
tract of humans with soil. My former colleague Richard Bradfield studied soils in the laboratory and field with the aim of helping farmers manage their soils and provide food for humanity in general. That's why he worked for years on international agricultural projects with the Rockefeller Foundation.

A soil creed that began to spread in the 1980s states that soil is a natural body that deserves scientific study and contemplation, as is accorded other natural bodies, the organisms, rocks, oceans, and stars. This formulation marked a radical change from viewing soil as merely a cog in the agricultural production machine, yet the creed has benefited farming in many important ways.

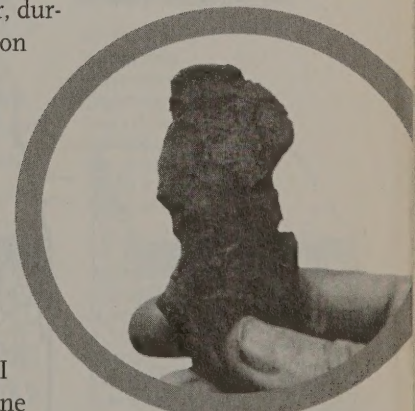
My own approach to soils has changed several times. In my younger years, with my farm background, whenever I thought of "soil" I visualized a plowed field. You seed a crop and what yield you get depends a great deal on the nature of the soil. Later, during my Missouri work on soil humus contents, I soon realized that the prime source of organic carbon in soils resides in the organic matter furnished by tree litter fall, grass mats, crop residues, and root production. In California, I got involved with pristine and near-pristine grasslands and forests and began thinking in terms of the "larger system" that is composed of soil plus vegetation plus animal life, a combination that is now known as ecosystem. Hence, I



Feeling the clay content of soil. Squeezing thumb and pushing slowly upward, this soil falls apart. 4 percent clay.



Squeezed and pushed, this soil stands up, then falls over. 29 percent clay.

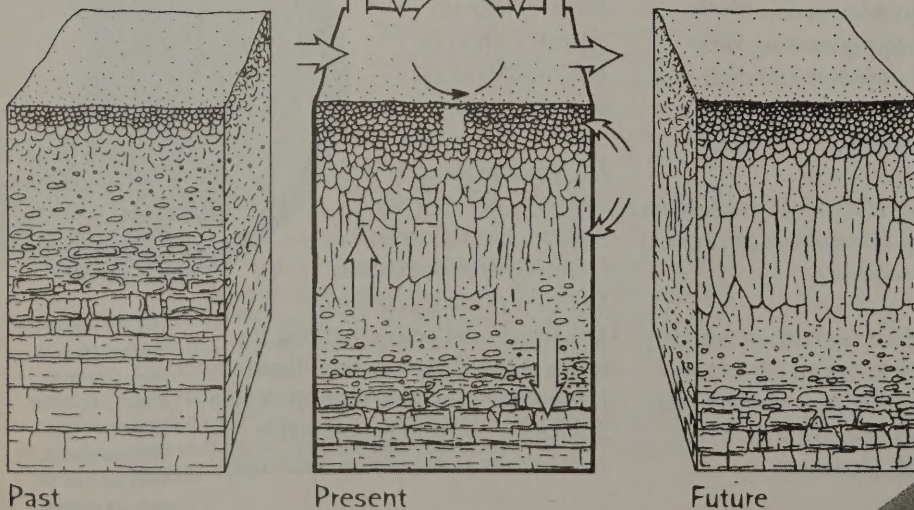


This soil withstands the slow squeeze-push. It holds at almost two inches. 44 percent clay. With experience, no tools but your fingers are needed.

# AN ENDANGERED SOILS ACT

There are about 20,000 soil species in the United States and none of them is intentionally protected. Hans Jenny tried to protect the special soils in the pygmy forest by protecting the forest itself. Today, states are beginning to declare "State Soils," to bring recognition to the uniqueness—and sometimes rarity—of their soils and to increase awareness that soil is a truly rich treasure that should be cherished. Most of these soils have been tampered with; plowed for food and fiber. No one has ever proposed an Endangered Soils Act for those soils most in danger of losing their top-soil horizons. Imagine the Federal Government announcing that 100 acres of every virgin soil species will remain unadulterated forever....

A soil has history. It is an open system with inputs from solar energy, rain and run-on, wind-blown minerals and organic matter, as well as outputs from wind and water erosion, and from evaporation. Within the soil's body, water, air, chemicals, and creatures move and alter the soil's structure and composition. A new soil emerges.



MODIFIED FROM ARIZONA SOILS. UNIVERSITY OF ARIZONA PRESS, 1985.

see soil in the context of a living, dynamic ecosystem, either a natural, or an agricultural, or a silvicultural one.

...Many ecologists glibly designate soil as the abiotic environment of plants, a phrase that gives me the creeps. Is the bark of a tree the abiotic environment of the tree? And what about the bacteria-rich rhizosphere? Looking at the root-soil boundary under the powerful electron microscope, an observer cannot tell where the biotic part ends and the abiotic part begins.

Soil contains over a thousand different species of lower animals, the earthworms, pill bugs, nematodes, millipedes, termites, ants, springtails, and amoebas, not to mention the millions of molds and bacteria. My late teacher, Professor S.A. Waksman, discovered in soils the microbes that produce the antibiotic streptomycin that cures tuberculosis; he, who signed his letters as "soil microbiologist," was awarded the Nobel Prize in medicine. When I add up the live weights, exclusive of roots, estimated by soil biologists, I find more living biomass below ground than above it, amounting to the equivalent of twelve horses per acre. The soil organisms consume oxygen from the soil air and give off carbon dioxide, and the

summation of the multitudes of

respirations characterize the metabolism of a soil individual. Hence, I designate soil as a living system....It is, however, not an organism because soil does not multiply: you don't find two masses of soil where there was one.

If all the elephants in Africa were shot, we would barely notice it, but if the nitrogen-fixing bacteria in the soil, or the nitrifiers, were eliminated, most of us would not survive for long because the soil could no longer support us. I can't help thinking of the claim that healthy soils make healthy people, and as an extension, I am intrigued by the thought that good soils make good people, but that notion seems untenable. Well, not wholly so. Working in the garden with spade and hoe soothes the minds of many people....

Observing soils, studying them, and reflecting on them induces respect, if not wonder. All of us relate to soil unconsciously in our daily nourishments that make us participants in the continuous flow of nutrients that originate in the soil.

Over the years I have acquired a kind of reverence for the soil, for the creature-world inside it, and for its character expressed in the profile features. Where big logging equipment turns soil upside down to make earthbeds for falling redwood trees, the mass of soil remains at the site and no "environmental damage" is said to occur. Yet the soil profile, the soil's signature and identity, is obliterated. Though I consider such profile destruction an irretrievable loss, I have never seen anybody shedding tears about it. My attitude may be a personal quirk, or a result of lifelong interest in soil. In the latter case, I might not be alone. Whatever, I am glad I feel the way I do.

...Reverence for the soil has turned me into a preservation advocate of natural, undisturbed soil, regardless of whether it is a good soil or a poor one, or a rare and endangered soil species or not. My wife, friends, and well-wishers helped

## State soils established by legislation

STATE	SOIL NAME AND CLASSIFICATION
Nebraska	HOLDREGE SILT LOAM (FINE-SILTY, MIXED, MESIC TYPIC ARGIUUSTOLLS)
Wisconsin	ANTIGO SILT LOAM (COURSE-LOAMY OVER SANDY OR SANDY-SKELETAL, MIXED TYPIC GLOSSOBORALFS)
Vermont	TUNBRIDGE SERIES (COURSE-LOAMY, MIXED, FRIGID TYPIC HAPLORHODS)
Oklahoma	PORT SILT LOAM (FINE-SILTY, MIXED, THERMIC CUMULIC HAPLUSTOLLS)
Florida	MYAKKA FINE SAND (SANDY, SILICEOUS, HYPERTHERMIC AERIC ALAQUODS)
South Dakota	HOUDEK SERIES (FINE-LOAMY, MIXED, MESIC TYPIC ARGIUUSTOLLS)
Kentucky	CRIDER SERIES (FINE-SILTY, MIXED, MESIC TYPIC PALEUDALFS)
Kansas	HARNEY SILT LOAM (FINE, MONTMORIL LONITIC, MESIC TYPIC ARGIUUSTOLLS)
Michigan	KALKASKA SAND (SANDY, MIXED, TYPIC HAPLORHODS)
Massachusetts	PAXTON SERIES (COURSE-LOAMY, MIXED, MESIC OXYAQUIC DYSTROCHREPTS)

preserve several soils in California: the pygmy forest ecological staircase (Jug Handle State Reserve), which is an age-sequence of marine terraces and their old soils; the Mt. Shasta mudflow area, composed of incipient ecosystems; Apricum Hill with a fossil laterite crust; and Jepson vernal pool prairie, held by the Nature Conservancy.

...These natural areas were set aside as benchmarks for assessing man-induced soil changes and for preserving unique segments of landscapes that possess pedological [soil-related] and ecological potential for teaching and research. While reverence for soil was not explicitly invoked, it helped sustain the efforts to secure these lands.

Society grants human beings the right to exist, regardless of whether we are useful or not, and that right cannot be abrogated without due process of law. The same privilege has been extended to a few endangered plant and animal species. I wish society would grant the same right to soil. The prospects are bleak.

...Extensive areas of good soils have been demolished during extraction of their minute particles of gold. The way you phrase the question brings up nature's edict that we humans cannot live without sacrificing plant and animal lives, and that land must be cleared for growing crops and building habitations if we do not want to live as nomads.

Today, the idea of stewardship of land is pitted against the belief in soil exploitation for personal gain and that soil is merely an economic commodity in the marketplace. And who decides "what is best for humans"? I place natural soils and ecosystems, the nature museums, on par with art museums, automobile and railroad museums, golf courses, racetracks, music halls and gambling halls, even colleges and temples. They all use up space and appeal to special groups of people who are not called "elitist," and all these places get public financial support and protection in one form or another.

**STUART:** *As a student of the sciences, how did you get interested in soil?*

**JENNY:** It was the other way around. I had an interest in soil and to comprehend it I needed science.

In my research, I tried to learn how soils are formed, how nature creates soils, and how long it takes to make a soil. In such studies investigators locate soils of known ages that may extend over decades, centuries, and milleniums. They analyze the soils; arrange the data according to soil ages, which yields "time sequences" of soils; and deduce how fast the soil bodies are changing.

One question looms large. What does nature have in mind, what is her goal of soil evolution? For the animal kingdom, evolution is said to improve the design of organisms, leading to higher, more complicated beings, with humankind at the apex.

**STUART:** *Is your query on what nature has in mind for soils a legitimate question, and if it is, why shouldn't we also ask about the purpose nature has for an entire ecosystem?*

**JENNY:** You might go a step further and ask, what is the purpose of all nature? And if you include ourselves [sic] as part of nature, what is our role on this earth? Soil science, or any other science, cannot provide an answer, only religion or mysticism might do that.

**STUART:** *What plan would you say nature has for soil?*

**JENNY:** On soft rocks the several dozens of time sequences so far on hand suggest that in high rainfall regions and in the absence of catastrophes, such as earthquakes and

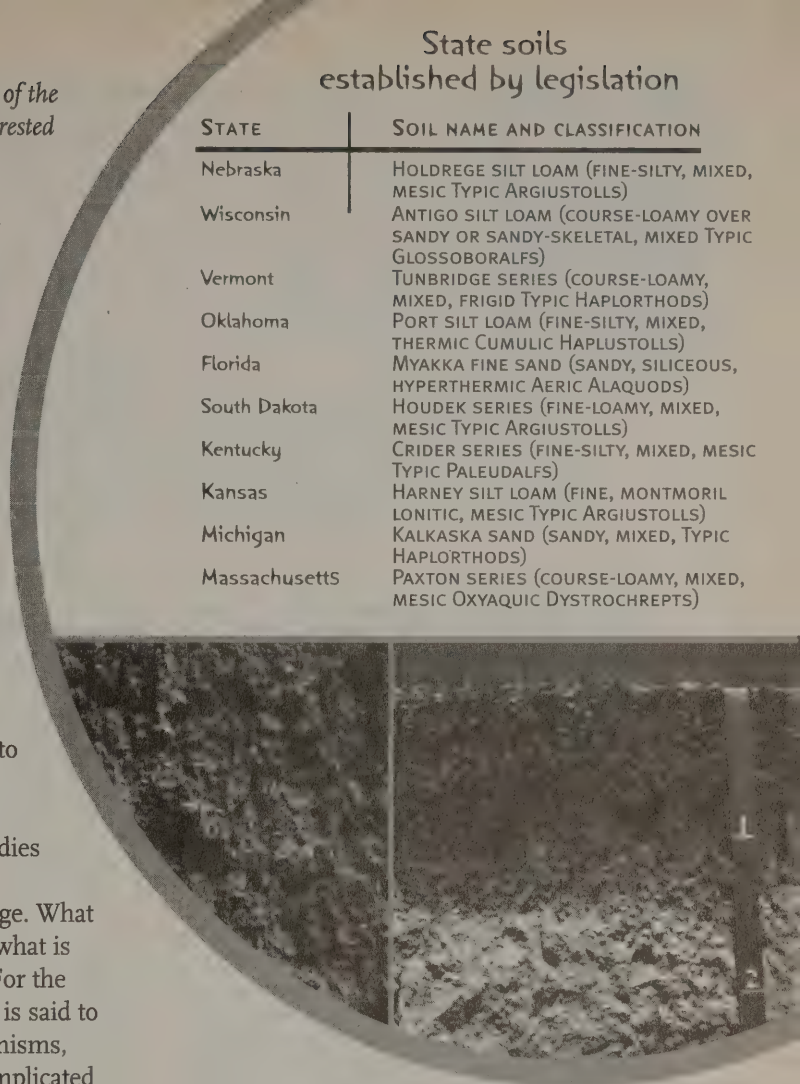
severe erosion episodes, the production of organic matter as biomass rises from near zero at the beginning of the sequence to a maximum in a few thousand years, and then very slowly declines because the endless water infiltration under high rainfalls leaches out the nutrients of the soil, raises the acidity, and may establish hardpan and claypan horizons that curtail root growth. Often these areas harbor unusual plants and animals that grow nowhere else (endemics), and such soils may play a role in the evolution of species. ⊕

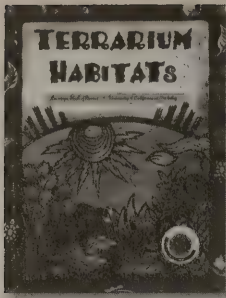
### SOURCES:

*FACTORS OF SOIL FORMATION: A SYSTEM OF QUANTITATIVE PEDOLOGY*  
HANS JENNY, 1994 (AN UNABRIDGED REPRINT OF THE 1941 EDITION); 288 PP. \$9.95. DOVER PUBLICATIONS, INC.

*THE SOIL RESOURCE: ORIGIN AND BEHAVIOR*  
HANS JENNY, 1980. OUT OF PRINT.

PHOTO OF HANS JENNY CONTRIBUTED BY GARRISON SPOSITO.

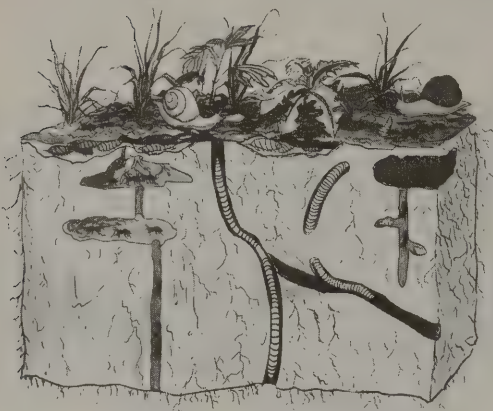




## TERRARIUM HABITATS

Kimi Hosoume with Jacqueline Barber. 1994; 88 pp. \$13.50. GEMS, Lawrence Hall of Science, University of California, Berkeley, Berkeley, CA 94720-5200, 510/642-7771, fax 510/643-0309, gems@uclink.berkeley.edu, www.lhs.berkeley.edu/gems.

They call it "guided discovery"; the Great Explorations in Math and Science (GEMS) series is written for teachers, parents—anyone who works with kids. Based on programs developed at UC Berkeley's Lawrence Hall of



Science, each book is tested and appraised by a battalion of educators from around the country. Multidisciplinary activities, logic puzzles, thematic sidelines—are all presented with step-by-step suggestions, materials lists (cheap and readily available stuff), and nontechy background information that reassures the novice but doesn't bore the science-trained.

*Terrarium Habitats* takes you sub-surface, to the underground cycles of decomposition, plant uptake, and animal harvest. Each chapter (Exploring Soil—Building the Terrarium—Adding Earthworms—Adding Isopods) builds on its predecessors; lets kids aged five

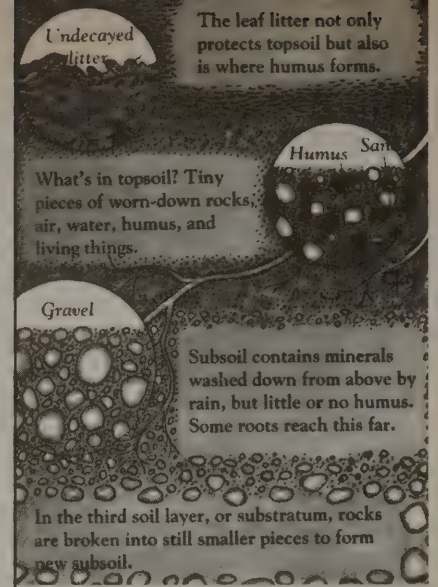
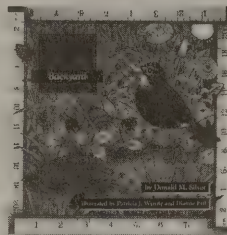
to eleven catch their learning-curve breaths. You get a snapshot of your mandate for every activity with clean illustrations and kids-in-action photos. —Nicole Parizeau

“Soil is beneath our feet every day, but we seldom get a chance to examine it closely....The activities in this session encourage students to sharpen their observation and communication skills as they make careful observations of soil; discover that soil contains living and non-living things including water and the nutrients necessary for life; understand soil's place in the ecosystem as it relates to plants, animals, and humans; and change negative attitudes about soil as dirty, “yucky,” or not worthy of study.

## BACKYARD

Donald M. Silver. Illustrations by Patricia J. Wynne and Dianne Ettl. 1993; 47 pp. \$10.95. Learning Triangle Press/McGraw-Hill.

From faceplate to index, this enchanting book in the One Small Square series is laced with juicy, full-color, morphologically detailed drawings. *Backyard* is edible stuff written for kids seven to seventy, and it's all about visual appeal. It BURSTS with illustrations: running critters, full-blown scenes of soil, cross-sectional views that dissect the yard in rewarding gulps—soil, habitats, and creatures all at once. Donald Silver's clear interpretive writing weaves like a millipede through the graphics in a logic-



chain of natural history. Thoughtful, kid-initiated activities sit solidly in the page margins. *Backyard* serves up every conceivable facet of a patch of yard. Irresistible, especially for readers in the eastern North American forests whose denizens are the book's stars. —NP

“The next time you sit down to dinner, take a good look at everything in front of you. All the plant parts on your plate were nourished by soil. The meat came from animals that ate plants that grew in soil. If your table is made of wood, it came from trees that grew in soil. Without soil there would be no food, no table to put it on, and no living things in your small square.

Dig down...and scoop out a handful of soil. It took hundreds, perhaps thousands, of years for the rocks to be broken down into the bits and pieces of sand, silt, and clay that you are holding in your hand.

## DIRT MADE MY LUNCH

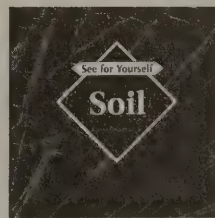
© 1979 STEVE VAN ZANDT. USED BY PERMISSION.

Dirt made my lunch, dirt made my lunch.  
Thank you dirt, thanks a bunch  
For my salad, my sandwich, my milk, my munch.  
Dirt made my lunch.

Dirt is a word we often use  
When we talk about the earth beneath our shoes.  
It's a place where plants can sink their toes  
And in a little while a garden grows.

—BANANA SLUG STRING BAND

*Dirt Made My Lunch and other albums, songbooks and slugstuff available from Banana Slug String Band, PO Box 2262, Santa Cruz, CA 95063, 888/327-5847, 408/476-5776, www.BananaSlugStringBand.com.*



## SOIL

Karen Bryant-Mole. 1996; 30 pp. \$21.40. Raintree Steck-Vaughn Publishers/The Steck-Vaughn Company, PO Box 26015,

Austin, TX 78755, 800/531-5015, 512/343-8227, fax 800/699-9459, www.steck-vaughn.com.

*Soil*, one of several titles in the excellent See for Yourself series for children, is about simple science based on nature. The format is straightforward; a page of easy-to-read text, a photograph of children performing a related experiment, and a facing page with more detailed photography. At the end of the book is a list of more “things to do,” like tricking earthworms by doing a rain dance

and growing your own tomatoes in really great soil. Included are notes for parents and teachers. The tiny index includes important words to learn, from “bacteria” to “tunneling.” An excellent starting point for two-to six-year-olds; this book delivers the goods with ease. —Pat Johnston

“Chalky soil contains pieces of chalk rock. Sandy soil has lots of sand in it. Clay soil is made up of very tiny pieces of different rocks. Loams are a mixture of clay soil and sandy soil.

...You can test your own soil. Put pieces of gauze inside two funnels. Place the funnels inside some tall jelly jars. Put some local soil in one jar and some garden-center soil in the other. Pour the same amount of water into both....Soil that holds more water than the garden-center soil is probably clay.

## DIRT

### The Ecstatic Skin of the Earth

William Bryant Logan. 1996; 202 pp. \$12.95. Riverhead Books, Consumer Services, 405 Marie Hill Parkway, East Rutherford, NJ 02073, 800/631-8571.



It's weird that we have no simple beautiful word like *sol* or *suelo* to bed down with. "Dirt" is so judgmental; "earth" jumps too quickly to Earth; "soil" leaps to dirty linen. William Bryant Logan sets out to purify dirt, to embed us so intimately in the skin of Earth that we will live momentarily, at least, entranced by its vibrancy. *Dirt* offers forty-four essays, each an intense short gawk into the invisible and visible livingness of soil. Logan digs it; he meditates on it with Hans Jenny, Thomas Jefferson, Dio-He-Ko, and George Perkins Marsh; he cherishes its clay and humic parts; he travels in gopher holes, to China, and through groundwater. In short, this is the most literate book to bring soil to soul and soul to the subterranean. Start here and you'll likely return here, just like the long, slow cycling of dirt. —PW

Radical disorder is the key to the functions of humus. At the molecular level, it may be the most disordered material on Earth. No two molecules of humus may be alike. Though no one has difficulty recognizing a humus molecule, it is quite likely unique, because it works upon fractal principles. Simple geometries define any given part of it, but the modes

for the combining of these shapes produce a vast array of different manifestations at different scales. For humus, similarity is rampant, but identity nonexistent.

The soil as a body is continually doing work. An acre of good natural Iowa soil burns carbon at the rate of 1.6 pounds of soft coal per hour. It breathes out twenty-five times as much CO<sub>2</sub> in a day as does a man. Every acre puts out a horsepower's worth of energy every day. Without a soil this productive, we would still be hunting and gathering in small bands.

On a field trip once, the great soil scientist Hans Jenny had me drive down a side road in Sonoma County, California. Beside us ran a field of wild grass with oaks scattered on the knolls. Abruptly, the vegetation turned into a scraggly stand of digger pine. We stopped the car to look for the difference. Beneath the oaks, the broken rock was schist; underlying the grassland were sandstones, but the sparse pines grew on a pretty, green stone.

...Here, we used our eyes to conceive the livingness of the world. I had driven past that landscape all my life, my eyes on the road ahead, noticing the "beauties" but really observing nothing at all. Here, by an oily roadside, with traffic sweeping by, I stepped out of time and into beauty, thanks to a ninety-year-old man who actually knew something. I could feel the Earth spinning on its axis.

Inert matter! As if there ever were such a thing. Beauty is the vocation of the world. Under the electron microscope, one can perceive the intricate harmonies of clays.

...The assemblies of the clays are like those hedge mazes and forests in which fairy-tale children become lost, like those places where the old woman is met and where treasures are won. The landscape of the clays is like the wall of the stomach or the tree of the capillaries, or the intricate folds of the womb. It is the honeycomb of matter, whose activity is to receive, contain, enfold, and give birth.

To try to understand the soil by taking a few trowelsful and submitting them to chemical tests is like trying to understand the human body by cutting off the finger, grinding it to paste, and performing the same tests. You may learn a lot about the chemistry of pastes, but about the intricate anatomical linkage of systems—and about the body's functions as a whole—you will learn nothing at all.

Like our bodies, the soil participates in the recirculation and transformation of the four major elements; earth, air, fire, and water. Like our bodies, too, it is full of channels and pathways, directing the elements into fertile combinations and transformations at distinct, organized levels of the whole structure. And like our bodies, it has a definite genetic form.

## Soils Smarts Access

### SOIL FOODWEB, INC.

[www.soilfoodweb.com](http://www.soilfoodweb.com). Soil Foodweb, from Corvallis, OR is the first commercial lab to offer analysis of the numbers, types, and activities of the critters in your soil's foodweb. Elaine Ingham is a great advocate of soil fertility by increased diversity, not petrochemicals. See their website for adult-level soil information and resources. (Suggested by Mary Appelhof.)

### WORM BIN CREATURES ALIVE THROUGH A MICROSCOPE

Videotaped, edited, and narrated by Warren A. Hatch. Flowerfield Enterprises. 1998; 31 minutes. \$25 (\$29 postpaid). Flowerfield Enterprises, 10332 Shaver Road, Kalamazoo, MI 49024, 616/327-0108, fax 616/327-7009, [nancy@worm-woman.com](mailto:nancy@worm-woman.com).

Anecdotal, pleasantly opportunistic (pseudoscorpion ambles into a frame of munching springtails), and truly fascinating. Not *National Geographic*, but this roving Oregon substi-

tute teacher's enthusiasm ("Whoa, what was THAT?") more than compensates for technique. Elementary and up.

### NATURAL RECYCLERS: STUDY OF DECOMPOSITION

For up to fifteen pairs of students. \$41.25. Ward's Biology Supply, PO Box 92912, Rochester, NY 14692-9012, 800/962-2660, fax 800/635-8439, [www.wardsci.com](http://www.wardsci.com).

Teacher's guide, student analysis materials, and suggestions for further investigation. How soil and other factors play a role in

decomposition of solid waste.

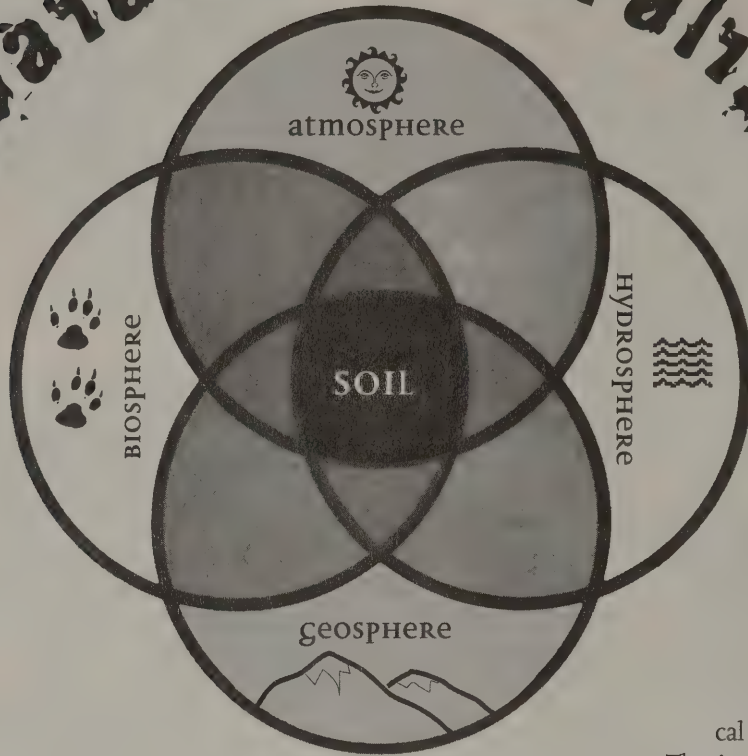
### HOW SOIL IS FORMED

For up to fifteen lab groups. \$73. Ward's. Materials, teacher's guide, and student instructions. How soil is made, what's in it, why we depend on it. **ROOT-VUE FARM** \$27.95. Scientifics™/Edmund Scientific Company, 101 East Gloucester Pike, Barrington, NJ 08007-1380, 800/728-6999, 609/547-8880, fax 609/573-6295, [www.edsci.com/scientifics](http://www.edsci.com/scientifics).

Seeds, soil, labels, and instructions for watching your (lab) garden grow underground.

For more soil exploration for the classroom, including test kits, CD-ROMs, and specimen displays, see *Carolina Biological Supply Company*, PO Box 6010, Burlington, NC 27216-6010, 800/334-5551, fax 800/222-7112, [www.carolina.com](http://www.carolina.com).

# Galileo's Naturalist



If I could do it all over again, and relive my vision in the twenty-first century, I would be a microbial ecologist. Ten billion bacteria live in a gram of ordinary soil, a mere pinch held between thumb and forefinger. They represent thousands of species, almost none of which are known to science. Into that world I would go with the aid of modern microscopy and molecular analysis. I would cut my way through clonal forests sprawled across grains of sand, travel in an imagined submarine through drops of water proportionately the size of lakes, and track predators and prey in order to discover new life ways and alien food webs. All this, and I need venture no farther than ten paces outside my laboratory building. The jaguars, ants, and orchids would still occupy distant forests in all their splendor, but now they would be joined by an even stranger and vastly more complex living world virtually without end. For one more turn around I would keep alive the little boy of Paradise Beach who found wonder in a scyphozoan jellyfish and a barely glimpsed monster of the deep.

—E.O. Wilson. *Naturalist*, 1984  
[Suggested by Lynn Margulis]

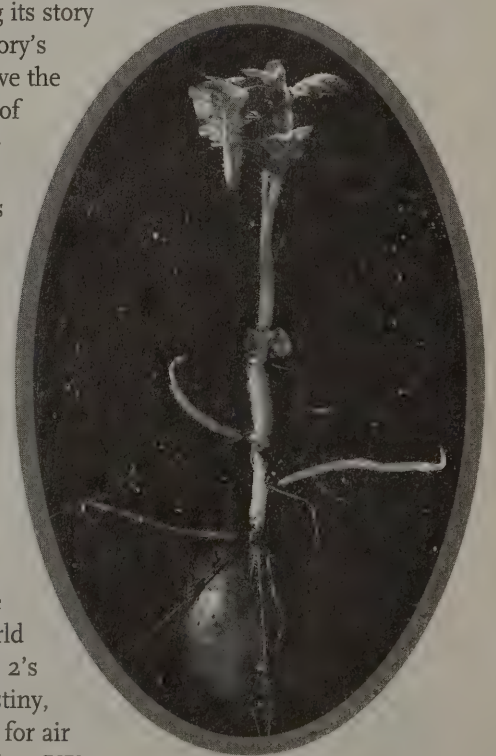
The Chinese phrase says: soil is the mother of all things. In the metaphor, she is the heart of the big cycles that connect the microbial microcosmos to the bounty of the biosphere. In her, flesh of hard rock, sands, and mal-

leable clay mixes with nutrient blood. In Mother Soil, all the major actors on the planet meet: the lithosphere (as pebbles, boulders, and granulated rock); the fast-moving atmosphere; the more viscous hydrosphere; and the teeming biosphere. In soil, coevolution attains its most baroque intricacy as the planet's elements, cells, and water dance their three-billion-year tarantella.

Maniacal naturalists love soils. Darwin's last book was not on natural selection, but on worms and earth, the regeneration of life out of soil on the journey from dust to dust.

Every nature writer has been frustrated by the complexity in soil. Soils contain the largest number of biological, biochemical, and biophysical phenomena of any slice of the planet.

They're home to the most intimate associations between organic and inorganic, biotic and non-biotic. They develop gritty and flaky and prismoidally shaped clumps; layers with lovely streaks and colors; and invisible micro-filigrees of biochemical exchange. As if soil's being buried did not make telling its story hard enough, the story's essential plots involve the rapid-fire exchange of electrons with more connections and alternative pathways than the human brain or the most high-powered computer. Evan Eisenberg (opposite) takes us on a preliminary journey into the city of soil. Bob Scarborough (p. 18) describes the overwhelming influence of the microbial world of soil on Biosphere 2's atmosphere and destiny, and its implications for air and climate on Earth.—PW



FROM SOIL (SEE REVIEW, P. 10).

**S**oil is an extraordinary thing, unlike any thing on or in the earth. But it is such an occult thing—hidden from us even when we dig into it, slipping through our fingers in more ways than one—that we feel the need to compare it to something else. If I had to choose the two above-ground things that soil is most like, I would choose a great city and a mess of entrails.

The city part is easy enough. Soil is, to put it mildly, densely settled. One teaspoon of good grassland soil may contain 5 billion bacteria, 20 million fungi, and 1 million protoctists. Expand the census to a square meter and you will find, besides unthinkable numbers of the creatures already mentioned, perhaps 1,000 each of ants, spiders, wood lice, beetles and their larvae, and fly larvae; 2,000 each of earthworms and large myriapods (milli-

approximately) equal. The main reason is that both systems are arranged, or arrange themselves, to maximize the exchange of energy, matter, and information. The maze of streets and the honeycomb of shops and offices in a city make possible millions of interactions between people each day. The arrangement of your guts similarly makes possible billions of interactions between molecules. Their compact, switchback windings, the villi or tiny projections that line them, the blood vessels that marble them; all these features effectively pack acreage into the space between your ribs and loins, so that you may extract as much energy and nutrition as possible from the food you eat.

Aristotle called earthworms the intestines of the earth, and he was not wrong. In fact, though, the soil itself is a tangled slaw of intestines, some

# Soil City

By **Evan Eisenberg**

pedes and centipedes); 8,000 slugs and snails; 20,000 pot worms, 40,000 springtails, 120,000 mites, and 12 million nematodes.

These citizens are often in motion, hurrying along the vast expressways made by moles, the boulevards of earthworms, the alleys between particles of sand or clay, the dank canals that these alleys often become. Certain districts and certain intersections—mainly close to the roots of plants—get especially busy. The citizens move in the dark, sniffing at chemical trails. They are constantly doing business with one another. They traffic in molecules: minerals, organic compounds, packets of energy. Their interactions are sometimes friendly, sometimes competitive, often predatory.

Though city haters of all stripes will readily grant the likeness of cities to bowels, I had better explain why a city lover such as myself should set them (transitively and

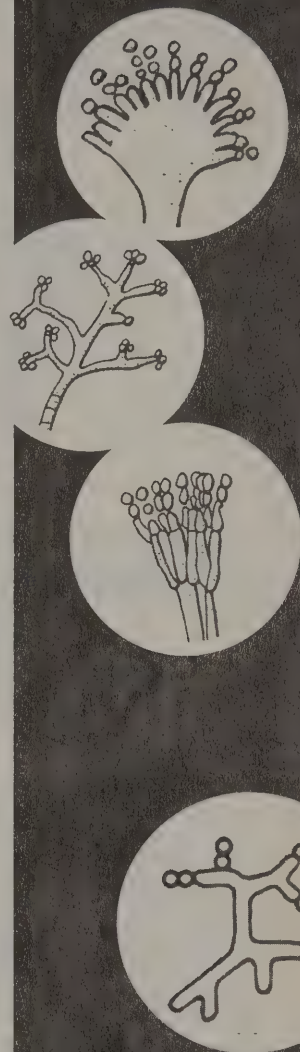
as thick as your arm, some a few molecules wide. The business of the soil, like that of the gut, is digestion and assimilation, and the creatures of the soil are always enlarging the surface area where these can take place.

Fungi, ranging in size from the great mycelial clot beneath a toadstool to tiny threadlike microbes, send out long fingers called hyphae that penetrate dead tissue. Besides roughing it up physically, they exude enzymes that digest it chemically, so that the simplified nutrients can be absorbed into the fungus. If you could somehow unravel the fungi in a single ounce of rich forest soil, they might easily stretch two miles.

A like figure might be racked up by filamentous bacteria called actinomycetes, which under the electron microscope look like something midway between antlers and bean sprouts. Among the most plentiful of all soil organisms, they give damp soil and damp basements their heavy, heady smell. They also secrete enzymes that break down dead tissue into nutrients, which are then absorbed along the sur-



Myxobacteria showing specialized fruiting bodies. Up to 76,000 per gram in moist soils.



Common soil fungi: aspergillus, trichoderma, and penicillin. Difficult to census, 20,000 to 1 million propagules exist in a gram. But it's the fungal flesh on a gram that can spread for tens of square miles that counts in soil ecology.

Actinomycetes appear in a limbo zone between bacteria and fungi. From 100,000 to 100 million per gram. They are saprophytes, living on dead organics.

MARTIN ALEXANDER, INTRODUCTION TO MICROBIOLOGY (SEE ACCESS, P. 38).

Top to bottom:  
 An earthworm.  
 Nematodes eat protozoa and bacteria. They keep soil pores open by moving and eating.  
 Close-up of a soil pore with water, two protozoa, rod-shaped bacteria, and dot viruses.  
 Close-up of soil pore. Hatched particles are clay. White particles are quartz sand. Spackling is organic matter.  
 Bacteria feed on particle surfaces. A fungal filament is shown at bottom.

face of the branched, springy filaments—though, like all bacteria, they lack the fungus's ability to break tissue down by brute force.

Roots, which do not digest but merely absorb, are not quite so rich in surface area, but they come close. The root system of a single four-month-old rye plant was found to have a surface area of 639 square meters—130 times the surface area of the aboveground plant—all of this packed into about six liters of soil. Much of this expanse is accounted for by root hairs, which sprout like a scraggly beard near the growing tip of the root. If a mere stripling of an annual plant can so pack the soil with roots, rootlets, and root hairs, one can imagine what lies beneath the sod of a mature perennial grassland or the litter of a forest.

Most plants, though, are unsatisfied with the mileage they get out of rootlets and root hairs. They also enlist the help of fungi that invade or cling to the roots and branch out into the soil. These unions of roots and fungi, known as mycorrhizae, not only increase the surface area of the root network, but also give the plant access to certain nutrients, such as phosphate, that it would be hard put to gather on its own. In return, the fungus gets a trickle of sugar.

Fungi maximize surface area—or, to be precise, the ratio of surface area to volume—by stretching out. Bacteria, their only peers in decomposition, achieve the same end by staying very small. To put it even more crudely, the bigger something gets, the farther its insides get from the outside world. If you want to

exchange energy and matter with the outside world as efficiently as possible, you had better stay small.

It is no accident that, apart from the soil, the other great habitat for bacteria on land is the guts of humans and other animals. Not only their small size, but their chemical virtuosity—the range of enzymes they can produce, the unlikely stuffs from which they can pluck energy—makes them as invaluable in your bowels as in the bowels of the earth.

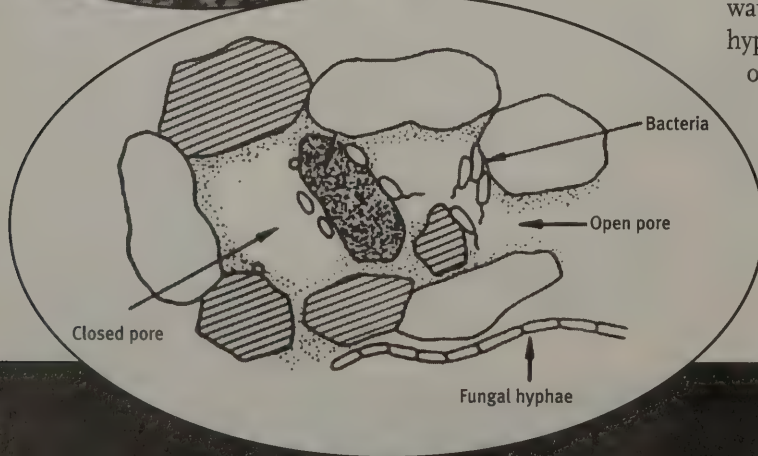
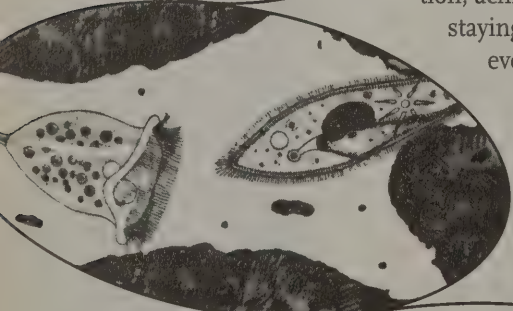
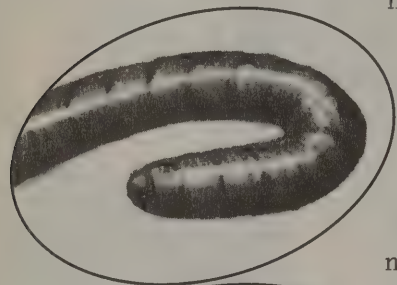
## Six Acres to the Ounce

As small as they are, bacteria still need a place to live. And here we come to the way living things conspire to expand the surface area of the soil itself. Surface area, I said, is needed for the exchange of matter and energy: not only for digestion, but for metabolism in general. In short, it is needed for life. For most organisms, it is useful not only to have a surface, but to be on a surface.

According to the great ecologist G. Evelyn Hutchinson, one of the things that make this planet hospitable to life is its interfaces between the solid, liquid, and gaseous states of matter: seashores, stream banks, the surface of the ocean, the surface of the earth. On closer inspection, each of these interfaces is infinitely involuted. Reference books tell us that the dry surface area of the earth is 57.5 million square miles, but the truth is that it can't be measured, any more than you can measure the surface area of a sponge. Solid ground is not as solid as it seems. A good loam is only half solid matter; the other half is space filled, in varying proportions, with air and water.

At Rothamsted Experimental Station in England, where a good part of the foundation of modern soil science was laid, researchers tried to measure the surfaces of the particles in a single ounce of clay-rich soil. They came up with a total of six acres.

Like many of the conditions that make the earth hospitable to life, this interface has been made by life itself. The making of soil starts with the breaking down of rock. In this work, wind and water are joined by the roots of plants and the hyphae of fungi and lichens. The work still goes on thousands of years later, when the bedrock is covered by yards of rich soil. Roots probe the bedrock, opening fissures which are then pried wider by the freezing and thawing of water and the trickling of natural acids. Under the insistent fingertips of rootlets and hyphae, rocks are ground to pebbles,



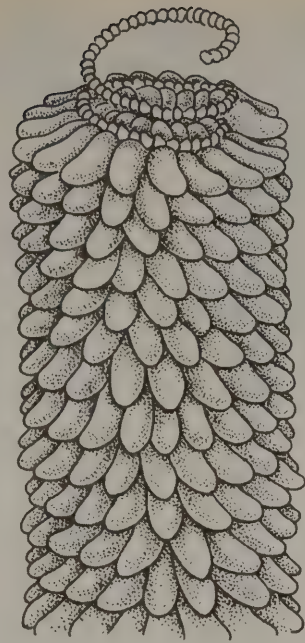


pebbles to sand, sand to clay. Some of the finer grinding goes on in the guts of earthworms and other creatures.

In the topsoil proper, mineral particles range in size from coarse sand grains to invisible specks of clay a thousand times smaller. The smallest particles are the most vital. They are colloidal: small enough so that their surfaces bristle with molecular hooks and charges. As we all know from experience, clay holds much more water than sand does. The surface of a clay particle eagerly coats itself with a film of water. It also grapples to itself positive ions, or cations, such as those of calcium, magnesium, and potassium. Clay is thus a reservoir from which water and nutrients are slowly released to the roots of plants.

But a soil with too much clay in it becomes damp, heavy, and airless, a bane not only to farmers but to plant roots and air-breathing soil organisms. From the point of view of all these parties, a good soil is one in which particles of various sizes are judiciously mixed. The mixing is done by the soil organisms themselves. Ants, termites, bees, wasps, moles, shrews, and other excavators bring up coarse particles from the lower soil horizons and blend them with the finer particles above. And nearly all the soil biota takes part in adding the most crucial ingredient of all: organic matter.

In the 50 percent of a good soil that is solid matter, 45 percent is mineral and only 5 percent is organic. Yet that 5 percent is roughly the equal of the other 45 percent in its ability to hold water and nutrients. Bits of organic matter are colloids like clay, but even more chemically active. In addition, they bind with soil particles to form aggregates, or crumbs: the texture you feel when you sift good soil through your fingers. In other words, they are able to granulate soil, like granulated sugar, so that instead of a sticky mess you get a light, crumbly stuff with plenty of pores for air and water, and big enough pores so that excess water drains out. Both the slimy halfway products of decay and the drier, more durable remnant known as humus have this vital knack. Besides being bound together with organic matter, a soil crumb may be glued together by the mucus of earthworms, slugs, and snails.



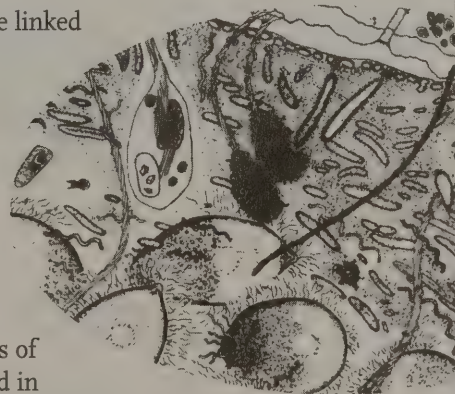
FROM FIVE KINGDOMS (SEE REVIEW, P. 112).

Almost certainly it is sewn together by the threads of fungi, rootlets, and filamentous bacteria, both alive and dead. The soil organisms do not just make the soil; to a great extent, they are the soil.

In multiplying the surface area of the world, the soil creatures create a multitude of worlds. Each aggregate is a tiny planet, complete with oceans, soil (organic matter), and wildlife. The drier parts are settled by aerobic bacteria, the filmy oceans by anaerobic bacteria and by the great leviathans of the one-celled world—amebae, hairy ciliates, undulipodiaties that move through the water by swishing their tails. In place of gravity, the soil has electrochemical forces: forces that, on this bejeweled scale, are far more potent than gravity.

That is why the soil holds water after a rain, instead of letting it all drain away into the water table. In fact, so tightly is water bound that the most desperate plant rootlets cannot suck all of it away. Even during droughts that make plants wilt and die, a great quantity of water still clings to the soil particles—a good thing, since it means that the life of the soil goes on. The strength of the surface charges also means that mineral ions and other nutrients are not washed away with the rain but are let go like time-release vitamins, to meet the needs of plants.

Despite all the forces that would keep one at home, there is a lot of interplanetary travel. When the soil is not bone-dry, the smaller spaces between particles are filled with water. In these linked oceans swim small aquatic creatures such as nematodes, rotifers, and crustaceans, many of them pygmy cousins of the ones found in ponds. Water streams toward thirsty roots, bearing dissolved nutrients. Microorganisms are carried along with the tide, or swim that way on purpose, tracking the chemicals that

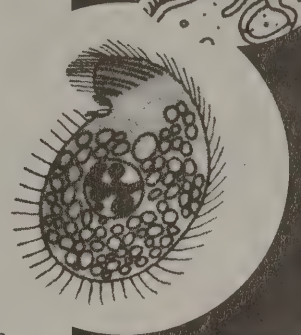


FROM THE MICROCOSMOS COLORING BOOK, HARPER COLLINS, 1994.

LEFT: Viruses are parasites, the smallest harmful "creatures." Because their protein coats are electrically charged they "stick" to clay particles which have the opposite charge.



Two soil protozoa with hairlike cilia. Top: Balantimo phorus. Bottom: Colpoda.

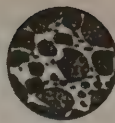
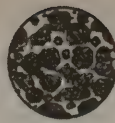
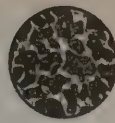
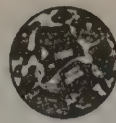
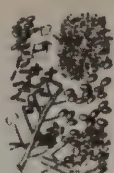
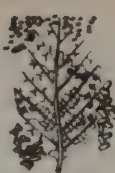
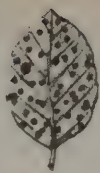
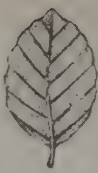


Middle: A mating mold (zygomycote) attacks two nematodes.



Termite and microbial community in hindgut. Termites biocycle wood back to humus with the help of gut bacteria and protists.

Right: A fallen leaf turns to soil humus: Bark lice and springtails (and sometimes snails) attack leaf in litter. Fly larvae further "window" leaf, providing areas for microbial colonization. Earwigs, mites, and other larvae skeletonize leaf. Enchytraeid worms join consumption, then earthworms process the mix of soil particles and leaf particles into casts. Clays and co-mixing continue forming "crumbs" from moving animals, microbes, and their excretions.



roots exude. After a heavy rain, water may fill the larger soil pores, too, driving out the soil air. For the aerobic bacteria, it is a cataclysm: they die off by the trillions. But their place is quickly taken by anaerobes, multiplying at the hair-raising pace that only bacteria can manage, or migrating upward from the water table. Protoctists pop out of the protective cysts in which they weather dry spells and make a holiday, feasting on the dying microbes. Later, as the water drains away, there are new holocausts, new boom times, new migrations. Migrations happen every day, in any case, as organisms move upward toward the sun-warmed surface, then downward to escape the night's chill.

cats, who like to bury their feces, earthworms go to some trouble to deposit theirs on the surface of the ground. Known as castings, these deposits are fine, dark, and fabulously rich, having twice the calcium, thrice the magnesium, five times the nitrogen, seven times the phosphorus, and eleven times the potassium of the surrounding soil. There is also a fabulous lot of them. On a single hectare of ground, in the course of a single year, earthworms may deposit five hundred metric tons of castings. These are excellent media for the growth of bacteria and fungi, as are, to varying degrees, the excreta of other invertebrates.

When bacteria and fungi take over the work of decomposition, they do not all plunge in at once. First to get their licks in are specialists in easily decomposed stuff such as sugars and amino acids. These breed and flourish when a new flush of debris hits the ground, then die off as their food is used up. More patient, slower-growing creatures—such as *Arthrobacter*, the most common genus of soil bacteria, and various higher fungi—then go to work on their leftovers: lipids, alcohols, chitin, cellulose. Lignin, the toughest plant material, is left for the common mushroom and its relatives—the last decomposers to kick in.

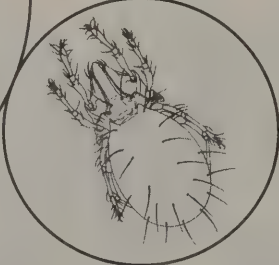
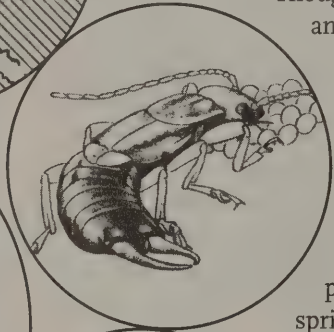
Other soil residents, less directly involved in the work of decay, nevertheless speed it along. Mostly they do so by eating those who do the work. Experiments have shown that litter decomposes faster when protoctists are present. The reason seems to be that by preying on the bacterial population they keep it young and healthy. One can apply the same reasoning to other steps of the trophic pyramid that is buried in the soil, from the meat-eating fungus that catches nematodes in a noose-like trap, to the mole that eats the heads off worms and hangs the trunks on the walls of its burrow (hundreds of them, like carcasses in a meat locker) against the lean winter. Though we cannot be sure that each of them plays a major role in the economy of decay, we cannot safely assume that any of them does not.

Why is decay so important? The fact that it encourages a good soil structure is part of the story. So is the fact that, without decay, we would all drown in a sea of leaves, corpses, and dung. But the big story has to do with the fact that nearly all

All soil life has a hand in creating the world, or worlds, of the soil. All soil creatures add their quota of organic matter to the soil; all excrete, all die, all play a role in the process of decay.

Though fungi and bacteria do most of the work, they have help. Ants, mites, millipedes, springtails, slugs, snails, beetles, and other invertebrates feed on plant debris, breaking it down physically

(which exposes a larger surface area to the action of microbes) and doing some simple and some not-so-simple digestion. Earthworms literally eat their way through the soil, which on its way through their lengthy guts is refined, enriched, and mixed with the proceeds of leaves that the worms have dragged into their burrows and eaten. Unlike



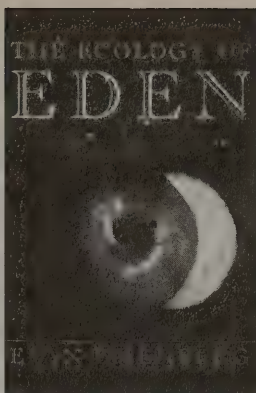
Soil insects (clockwise from top): springtail eating a larva; earwig with her eggs; soil mite; soil bug.

aboveground life depends on plants. Plants can get energy from the sun and carbon dioxide and oxygen from the air, but their needs for water, carbon, nitrogen, sulfur, potassium, phosphorus, and other nutrients must be met by the soil. And they are very particular about the forms these nutrients take. First off, the nutrients must be readily soluble in water, so that the roots can take them up and the plant's tissues can move them around. The complex organic compounds of which living tissue are made are not readily soluble in water. If they were, you would dissolve when you took a bath. In fact—since your body is mostly water—you would dissolve right now, leaving this book to soak in a puddle of broth.

If you took a newly dead human body, sterilized it with radiation, and planted a seedling in it, the seedling would not grow, not even if you watered it every day. Neither would it grow in a sterilized pile of leaves. Agents of decay—bacteria, fungi, and the rest—are needed to break complex organic molecules down into simpler molecules that are soluble in water and usable by plants.

In the case of minerals such as iron and manganese, some of the same agents perform just the opposite function. These minerals are readily soluble in water and readily taken up by plants—too readily, perhaps, since at higher doses they are toxic. Luckily, in well-drained soils they are oxidized by microbes so that they become less soluble, and are taken up only in the small doses that plants can handle.

It may sound as if the soil were an industrial facility, an interlocking set of assembly lines in which everything is regulated for the greater good of the daylight world. That is not so. As every gardener knows, some bacteria, fungi, nematodes, and insects can do great harm to plants. Some can harm humans directly. The soil is less a factory than a souk, a Casbah, a flea market, an economic free-for-all in which each buyer and seller pursues his or her own interest, and in which every scrap of merchandise—second-hand, seventh-hand, busted, salvaged, patched—is mined for its last ounce of value. Decay is good business because there are nutrients to be extracted and energy to be gained from the breaking of chemical bonds. If the net effect of the activity of the soil biota is overwhelmingly helpful—in fact, vital—to life on street level, it is not because nature has ordained it so, but because the various forms of life above and below ground have coevolved. ☉

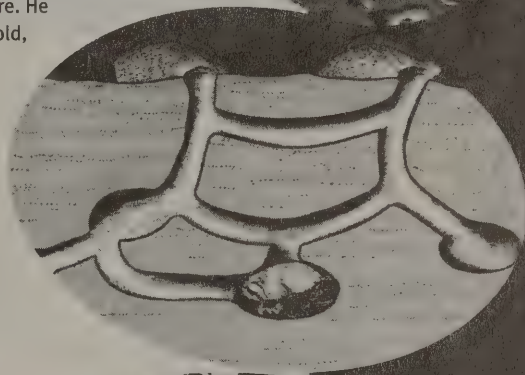
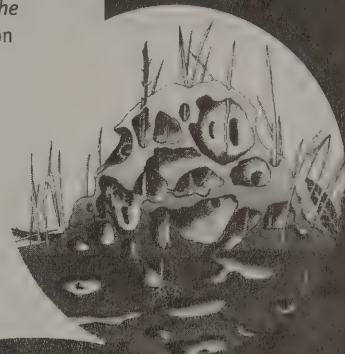


This chapter is excerpted from *The Ecology of Eden* by Evan Eisenberg. Copyright © 1998 by Evan Eisenberg. Reprinted with the permission of Alfred A. Knopf, Inc. Evan Eisenberg is composed in bits like soil. Part urban gardener, part cantor, part philosopher, part classicist, part biologist, part journalist. He appeared in our predecessor, *CoEvolution Quarterly*, over a decade ago. His first book, *The Recording Angel*, is on

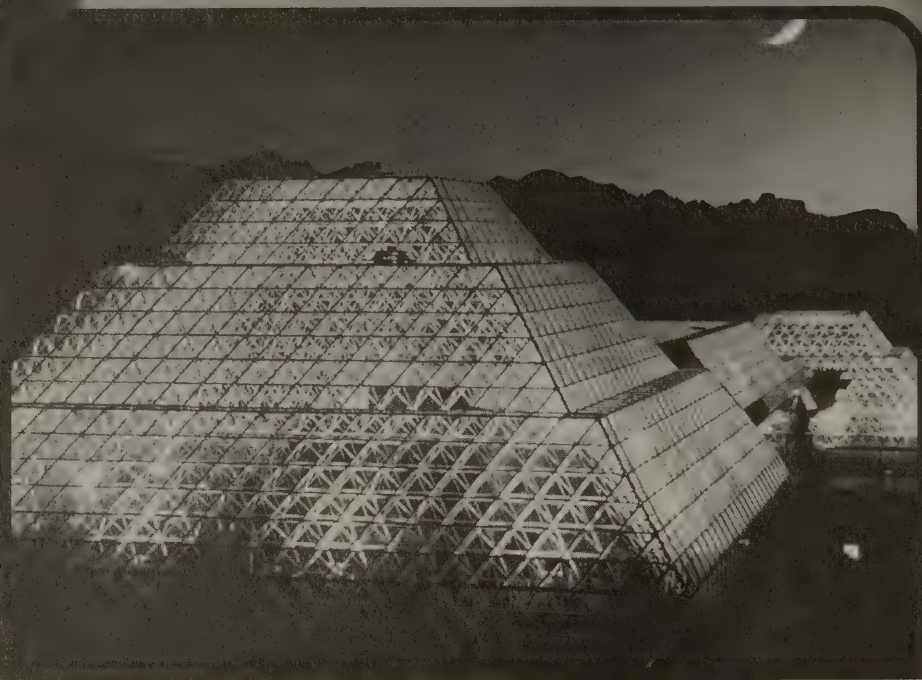
the cultural impact of recorded music. *The Ecology of Eden* is a quest to subsume all ponderings into delightful musical frameworks—machine and garden humming together; industry and ecology bebopping to Thelonius Monk; city and country finding joy in myriad polyrhythms.

Paradises he finds in human endeavors are very familiar to Whole Earth readers (e.g., John Todd's Living Machines; Denmark's ecological industrial parks; the Gaia hypothesis). Eisenberg is the best composer of an earthy, intimate future. He trumpets like Gabriel from the cold, dead space of earthlings (us) in an existential hell. —PW

"Bioturbation" is the movement of soils, the upwelling of minerals, by animals. Top to bottom: Cross-section of the nest of a brown garden ant; cross-section of a badger's burrow; mole tunneling; marmot standing sentinel over burrow.



FROM KARL VON FRISCH, *Animal Architecture* (OUT OF PRINT).



Photos by Peter Menzel (see page 73)

# My Life as a Designer of Soils

## Dirt-Cheap Lessons from Biosphere 2

by Robert Scarborough

Biosphere 2, in southern Arizona, was the largest totally enclosed ecosystem ever constructed. While it was sealed, less than 10 percent of the original atoms escaped. Although physically closed, it was in part energetically open to sunlight and the power grid, and in part open to information by telecommunications.

Eight biospherians lived inside the 3.2-acre sealed "greenhouse" for two years. There were two plant-growing regions: a half-acre of intensive agriculture, where all plant food for the crew was grown, and a 2-plus acre "wilderness" area, divided into four major vegetated "biomes." —PW

Hydroponic gardening might seem to be ideal for situations requiring intense and confined human activity. It sidesteps having to provide a large bulk of suitable soil material to grow plants, utilizing instead trays which expose the roots,

which are kept continually moist with an appropriate nutrient spray. However, this interface of air, roots, and nutrients renders the plants extremely vulnerable to any accidents, such as a wrong-nutrient formula or shutdowns that dry out and starve the roots. Two valuable attributes of soil are its abilities to maintain nutrient equilibrium and to hold moisture. So Biosphere 2 designers decided early on not to risk relying on techno-fickle hydroponics for the crew's plant food. They opted instead for a soil-based world; a decision which would have serious and unexpected consequences.

No one had ever built a soil-based closed environment like this before, so the designers had no precedent and little existing science to build on. They decided that the best chance for success lay in reproducing as many different "mini-ecosystems" as possible, and hoped that enough feedback loops would develop in the diverse soils to help balance the composition

of the atmosphere.

The ecological design team, Ghillean Prance, Walter Adey, Peter Warshall, and Tony Burgess, called on me to fill up the concrete bathtub foundation with what would amount to 30,000+ tons of soil, in thicknesses ranging from six inches to twenty feet. I was to simulate as closely as possible the soil texture and conditions of about thirty different kinds of soils appropriate to desert, savanna, Mexican thornscrub, subtropical mangrove swamp, sandy ocean beach, and shallow marine sediments—a bewildering variety.

Our new world raised many questions. How do you bio-engineer for far different relative volumes of air-to-ocean-to-soil, and incredibly faster turnover times of nutrients, than exist on our planet? Will the soils change the atmosphere in unpredictable ways? What kind of soil layering best suits an artificial biosphere? Will different patches of soil really keep plants from invading

other biomes? Will the lack of wind change the soils because there will be no aeolian (wind-borne) deposits? Will the soil's blue-green bacteria thrive with only half the usual sunlight? If not, then what?

## DESIGNER SOIL

We quickly realized that trucking in untold tons of the correct soils over hundreds or thousands of miles was both cost-prohibitive and legally impossible because of agricultural regulations. This forced me, much as I disliked the thought, to invent close analogues to natural soil profiles and textures, using local soil types and a home-grown recipe. I instantly became a designer of soils.

I hit upon a series of recipes requiring just fifteen local soils, which could be blended in various proportions to reproduce not only the broadly different soil types of the desert and rain forest, but also the two- or three-part layering of most natural soils. Tricky soil volume calculations dictated the volumes of components to be quarried. Only the carbonate sand for the ocean bottom and beach biomes had to be imported—dredged offshore from the Bahamas, barged through Houston, and trucked to Arizona!

My designer-soil mentality had to accept a compromise for two special soil properties—soil pH (acidity/alkalinity) and salt content. Although farmers change pH by spreading huge amounts of lime on their soils, pH adjustments are hard to maintain in other soils, as I found out when trying to acidify dune sand-piles with hundreds of gallons of concentrated sulfuric acid, to little avail.

Similarly, the bulldozed heaps of arid land soils would have needed more rain or an enormous amount of pumped water to leach out the salts before introduction into Bios 2. We simply accepted their excessively salty state and crossed our fingers.

We had early thoughts of sterilizing all the soils except for a few helpful soil microbes, an idea quickly rejected. No one knew which soil microbes were useful for what, or

how to sterilize the building, people, water, and soil. For fun and buffer-ance, I “salted” various soils with local microbial communities. For the small, dried “playa” pond in the Bios 2 desert, for example, I imported some muds and black stinky organic slimes from an Arizonan playa. We figured that all the microbes would simply duke it out in some quiet microbial war. There would emerge mystery winners which would drive the system, and we would remain all but oblivious to the specifics. To this day, the living soil remains a black box—except for the nematodes which made themselves obvious by attacking food plants.

Finally, the administrators of Bios 2 made a fateful decision. Because the system would be closed, they insisted that organic matter could not be added or removed once the structure was sealed. It was a Noah's Ark image—once for all and all at once. So as a safety factor we enriched most of the soils with extra organic matter. Even the desert sand dune, made with trucked-in real-world dune

sand, was enriched with several percent shredded twigs.

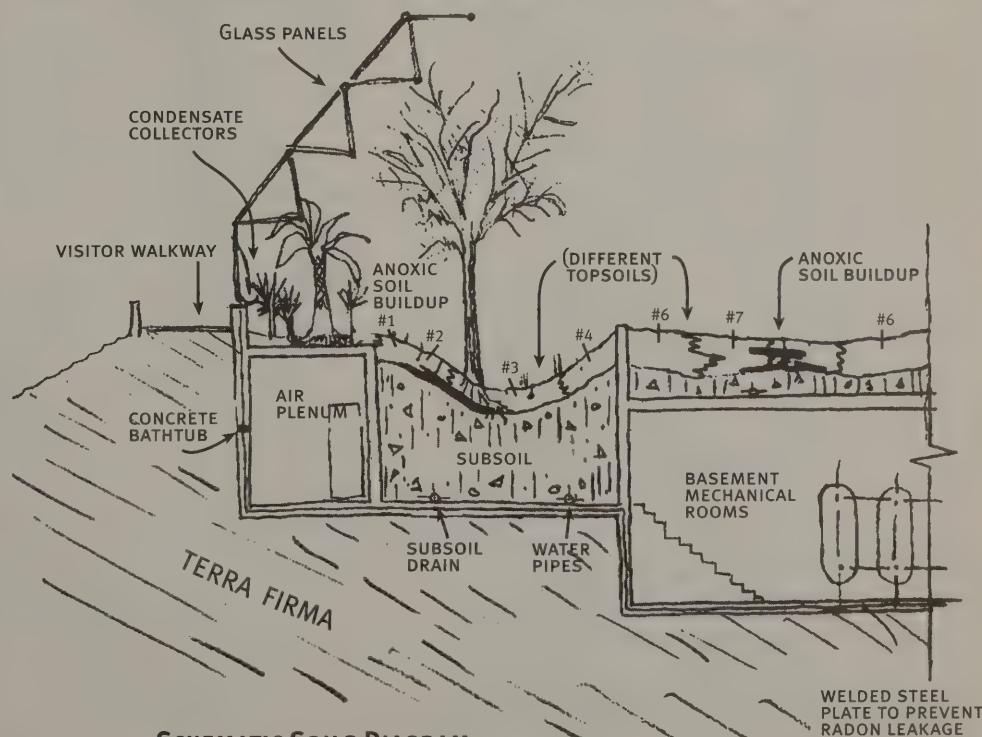
The decision would prove costly.

## UNPREDICTED RESULTS

The crew planned to enter the structure in late September 1991. In two-week trial closures, we discovered that the atmospheric carbon dioxide level rose rapidly, with no way of predicting its high point and no way of shutting down the problem. In the last weeks before final closure, we made a panic decision to install a carbon dioxide scrubber, a mechanico-chemical device that removes CO<sub>2</sub> from the air in the form of calcium carbonate suspended in a solution of lye.

Closure came. Sure enough, the CO<sub>2</sub> concentration shot up. The only place it could be coming from was the soils—probably as a result of ever-increasing populations of microbes (which release carbon dioxide during respiration, just as we do) as they feasted on the excess organic matter. The crew tried to balance the greenhouse gas. They turned down

An unexpected sink of CO<sub>2</sub>. The “bedrock” of Biosphere 2 is cement. On closure, the cement had not “cured” and was still reactive. CO<sub>2</sub> was consumed by the cement, but not fast enough to prevent increased levels in the atmosphere (see Whole Earth No. 89). During the curing, CO<sub>2</sub> turned the cement more acidic, which promoted rusting of the rebar. After the end of Mission 1, we applied experimental paints to stop the assimilation of CO<sub>2</sub> in order to protect the steel.



**SCHEMATIC SOILS DIAGRAM,  
BIOSPHERE 2, ORACLE, AZ.**

the temperature to slow down soil microbial metabolism. They ran the scrubber periodically. During the last year, they tried to increase CO<sub>2</sub> uptake through photosynthesis, by pruning trees and mowing the grasses so they would grow new stems and leaves more quickly. By the end of the first mission, all available nooks and crannies in the colder (microbially less active) basement were filled with harvested wood. And although turning soils released more CO<sub>2</sub> as the microbes exhaled directly into the atmosphere, biospherians could not stop "plowing"; they were running short of food.

### SALT AND SOILS: AN OLD STORY

To make matters worse, the crew watched as the saltiness of the big sump tank, which collected seepage water from the soils, increased faster than expected. Salts harm plant growth, and as the sump water was to be used as rainfall, the crew had to initiate a series of engineering "fixes." They used condensate water off the greenhouse glass, and water cleansed by reverse osmosis, to keep the recycled seepage water as diluted as possible.

But why was there so much salt so fast? My best guess is that enhanced atmospheric carbon dioxide formed high levels of carbonic acid (soda pop acid) in the soil's pore spaces, hastening the breakdown of soil minerals such as feldspars and amphiboles which form clays and soluble salts. (A tiny part of the salt problem came from a silt loam soil dredged from a nearby cattle tank. The soil contained salty bovine urine.) In other words, without strong sunlight and a huge ocean to supply rainwater, Biospherians needed special machines and expensive electrical energy to maintain a buffered soil.

### BIOREGIONAL REVENGE

Meanwhile, the home soils of southern Arizona began to assert themselves in the ocean and marshes. The bulk of materials under the ocean and the marsh soils consisted

of local red limestone clay and limestone boulders, valuable to buffer oceanic minerals. They also contained traces of copper, lead, zinc, cadmium, lead, molybdenum, etc., metals characteristic of the soils of this part of Arizona, where they are commercially mined. We knew that beforehand, but didn't regard the metals as important, since these designer sediments would be covered with thin layers of the special carbonate sands from the Bahamas—which we thought would act as a barrier and

prevent the metals from diffusing into the salt water above.

Instead, another bio-geologic interaction surprised us. We hadn't counted on the burrowing creatures—worms and mollusks. They quickly altered our neat layering with their pesky bioturbations, defeating our stratification setup.

### BEAUTIFUL COMPLEXITY

Finally, there was the most mysterious and least predictable soil-related lesson. The miniaturization process

## Soils and Global Warming

Here's the cycle. Carbon in the atmosphere enters plants during photosynthesis, then enters the soil as the plants decompose. It goes back to the atmosphere during decomposition by microbial action. During the growth period and early decomposition stages, soil takes carbon dioxide out of the atmosphere. During later decomposition, it puts it back.

Climate-change experts would like to manipulate soils to help lower greenhouse gases, especially CO<sub>2</sub>. But the devil's in the details, and our ignorance of soil/plant/decay cycles has become painfully obvious. Before nations or corporations can receive credits for using soil as a carbon sink, we need to know if it is a sink; which greenhouse gases can be sunk (e.g., methane, nitrous oxides, or the more potent fluorohydrocarbons); and for how long.

Monsanto and some environmentalists believe that no-till agriculture (vs. burning or plowing) is a good way to gather carbon into soils. The Midwest has lost one-third of the carbon-rich humus that once existed in its topsoil. Get that back and a small (perhaps 5 to 8 percent) of the US's contribution to the greenhouse effect could be reversed. Monsanto, we might note, also likes no tillage because it sells a herbicide to kill the weeds that thrive in the absence of tilling.

Others promote reforestation as

a way to buy time. If the carbon stayed inside the trunks and roots of large trees, we might have from a few decades to a few hundred years to switch fuels before the trees die, decompose, and let loose their carbon. But very little is known about which trees are best, which trees exhale more CO<sub>2</sub> than they absorb under drought stress, and at which stages (from saplings to old growth) trees absorb the most. Some people have suggested cutting old growth, because they believe that young trees absorb more carbon and that old-growth trees converted to lumber store carbon ably. Others believe that stopping erosion would make a difference in carbon dioxide release and retention, or that legumes are preferable to petrochemical fertilizers. The radical suggestion is to stop paving over the soils, so that the microbial world has a chance, at least, to gather CO<sub>2</sub> from the atmosphere. The utility of any of these ideas needs confirmation.

Finally, the most skeptical crew thinks that improving soils is not the most effective way to reduce greenhouse gases. Soils do need help, they say, just because they're damaged, but the big potential climate-change impacts are in the transportation and energy sectors (e.g., coal burning), and all R & D efforts should be focused on quick emission reductions, not on building better sinks.

—MKS and PW

did *not* simplify the feedbacks. The carbon, nitrogen, and other nutrient cycles fed each other.

Throughout the four years of closed-system operations, careful analysis of air detected a rising quantity of a trace gas called nitrous oxide, "laughing gas." N<sub>2</sub>O was once thought to be benign, but more recent professional medical opinions consider the gas to be bioactive, and some published evidence suggests it interferes with the human body's utilization of vitamin B<sub>12</sub>. N<sub>2</sub>O gas in Bios 2 was probably produced by denitrifying bacteria in the poorly drained, water-saturated ("anoxic") soil zones like the rice paddies. In water-saturated soils, soil bacteria that specialize in oxygen do poorly and microbes that can use nitrate (NO<sub>3</sub>) for their oxygen supply replace them. These microbes exhale N<sub>2</sub>O. The problem was aggravated by the constantly high air humidity, low plant transpiration rate, leaking sprinkler systems, and high nitrate production by bacteria in other soils. Water also piled up at the interface between the porous topsoils and tighter subsoil.

The biospherians and the design team considered turning to the in-place soil bed reactor—designed to pump high-pressure air from the basement through the one-meter-thick, nutrient-rich soil—with the hope that the process would alter the gas to harmless nitrogen. But forcing the air through these nutrient-rich soils would aggravate the already runaway CO<sub>2</sub> concentration in Biosphere 2 air: a frightful possibility. Biosphere 2 air had 2,000 ppm of CO<sub>2</sub> (compared with about 350 ppm in the Earth's atmosphere); the soil air was 50–80,000 ppm. A puff of soil air contained about forty times more CO<sub>2</sub> than the atmospheric equivalent. Solving the laughing gas problem would mean exacerbating carbon dioxide overload. So no one dared flip on the switch.

## THE LESSONS

The system designers had hoped that this little world would fall quickly

into some state of human-tolerant homeostasis, producing entertaining and positive lessons, perhaps tending toward one of Jim Lovelock's little black-daisy Gaia worlds. Or, they supposed, a massive system collapse or runaway condition would result from some unknown critical factor not designed into the system, and the experiment would prematurely cease—but knowledge would still be gained. But the system just ran on, in its own unique unfriendly way, at its own speeds and design.

We still do not have the formulas worked out to fix the soil/water/atmosphere problem at Biosphere 2 (or in our planet's biosphere). We can only guess that in Biosphere 2, more sunlight for increased photosynthesis and oxygen, and less organic soil amendment, would have been needed. Even the best scientists with whom we consulted, such as Wally Broecker of Columbia University, could provide little help in designing soils which would stabilize to a human-friendly atmosphere.

From the start, we knew that we could not replicate Earth's relative proportions of land, atmosphere, and water. If we take land as the baseline, Biosphere 2 contained a lot more atmosphere and a lot less ocean, proportionately, than the Earth. We had a soil-dominated ecosystem, as if the expanses of ocean and land mass had been reversed on our planet. A closed system resembling Earth's land-to-ocean ratio would have been three-quarters water—not logistically likely. We learned that no closed system will possess a human-friendly atmosphere without some compensatory engineering to scrub excess CO<sub>2</sub> and N<sub>2</sub>O, as well as to increase oxygen. The proportions of our real-world biosphere's land, water, and atmosphere are unique. Change any one and you change them all.

Furthermore, I was struck with the simple importance of the moisture-holding capacity of different kinds of soil. When earth scientists and environmentalists discuss soil or why some plants thrive better in some soils than others, we often con-

centrate on pH values, trace salts, soil chemistry, or similar properties. But to maintain diversity, stewards of "wilderness" need to focus more on the dynamics of water-holding in soils or in zones where soil textures meet.

## THE CHANGING OF THE GUARD

Columbia University assumed management of Biosphere 2 in 1994. No one could suggest a simple method to bring the closed-system atmosphere into friendly balance, other than by removing all the soil. The conclusion was that to maintain the inside atmosphere at a near-planet ambient it would be necessary to continually flush Biosphere 2 with outside air. That has happened. Closed-system conditions no longer exist, and may never again be attempted. Ongoing closed-in, live-in human experiments at NASA and in Russia utilize hydroponics and eliminate the soil factor. But, even with no soil, they have not been able to stabilize the closed system atmosphere for any length of time. In one Russian experiment, a rotating tank of chlorella (an alga) released a toxin which in Nature has room to disperse. In the closed system, it choked the humans.

We have been humbled by a beautiful, enormously complex soil ecosystem about which we still understand very little. Death and regeneration in the microbial world; assimilation and excretion by microbes, plants, and humans; mobilization of carbon and its storage in plant cellulose; the dance of biomass and bioproducts—all need to appear front-and-center in our understanding of Biosphere 2...and of Earth. We have much to learn before we can talk with any confidence about emerging questions such as the relationship of soil to global warming, for instance. We are in kindergarten, just beginning to view the inner workings of the extraordinary living system called soil. ☉

Bob Scarborough was obviously the soil scientist for the design of Biosphere 2. He wrote on the Earth's wobble and the impact of dams, in *Whole Earth* No. 93. He's presently teacher, researcher, and hydro-geologist at the Arizona-Sonora Desert Museum, where he's on the team excavating and reconstructing a new species of dinosaur. He's writing a book on the geological history of the West—from the beginning. —PW

# The Soil Bank

O<sub>2</sub>

Fe<sup>++</sup>

SO<sub>2</sub>

Natural capitalists regard soil as a special type of capital good—expensive, long-lasting, not purchased on a regular basis, used to produce other goods (especially our food, fiber, and livestock forage). Soil can also be envisioned as a bank that offers multiple services. To oversimplify, nutrients are the money, plants the customers. Nutrients are the currency, because they are the most reliable stores of value and the media of exchange needed to produce almost any of Earth's life-sustaining products. Soil money comes in phosphate, potassium, and nitrogen denominations; and in an infinite variety of carbon scrips. Time-release topsoil safe-deposit boxes contain seeds and spores that insure yearly production. The Humus Fund accrues interest as soil organic matter, and soil and water buffer and circulate various chemical funds. Overall, soil maintains, stores, schedules, offers, and supplies the cash flows of nutrient currency. The collapse of soil banks can bring down civilizations.

Take classical Athens. Traditional histories talk of Pericles and Alcibiades. They take the short view, recounting a plague in Athens as the reason for the city's downfall. Soil histories take the long view. They start with the arrival of the iron ax in Hellas, the cutting of oaks, and the subsequent loss of topsoil. Farmers in a denuded Attica had to switch to subsoil crops—olives and wine grapes. But grains grow only on topsoils, and the Athenian soil-bank account was too impoverished to produce enough to feed the populace. So the Athenians looked to conquer Sparta (a lowland non-eroded landscape) and appropriate its grain fields. For twenty-seven years, Athens and Sparta fought the Peloponnesian War, stopping the fighting only at harvest time. Athens lost only when Sparta burned the few remaining Athenian grain fields and threatened the subsoil economy with starvation.

In this longer view, the subsoil economy matured, and with it the craft of utilizing subsoil clay to make amphorae for storing and shipping olive oil and wine. Clay-based ceramics and classic Greek pictorial art blossomed. The Athenians built ships to trade oil and wine for the grains grown on the Nile's fertile, ever-renewing floodplain soils. This arrangement worked for a long while, but Athens's dependency on trading subsoil- for topsoil-products eventually led to its defeat; vulnerable at sea, it could not survive after losing various complex naval encounters.

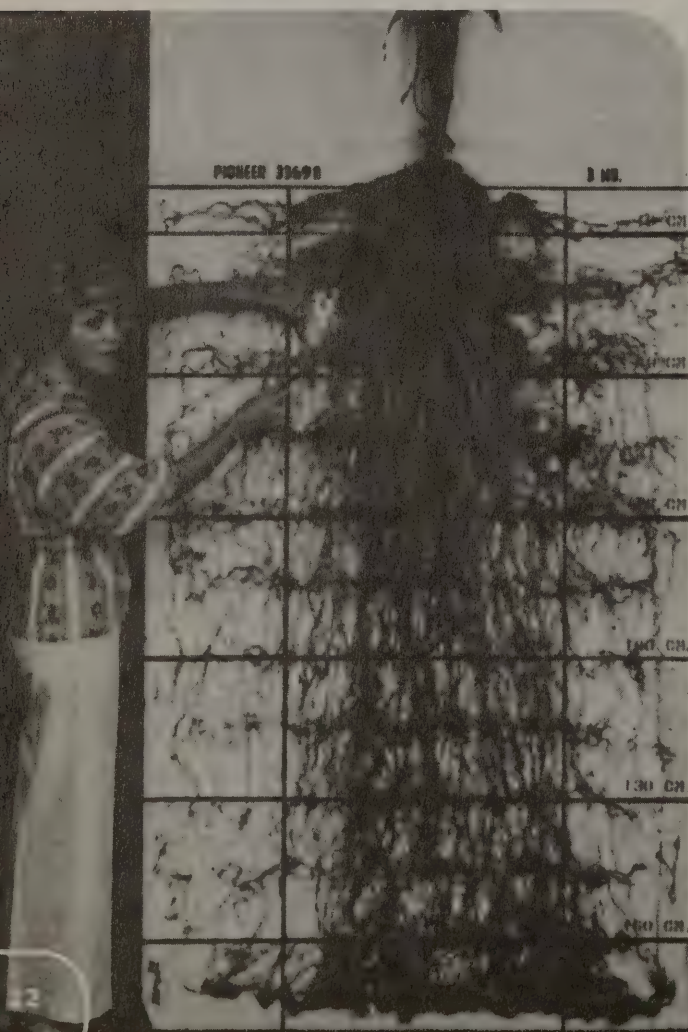
Soil bankruptcies appear and reappear in post-agricultural history; the Tigris-Euphrates, the Yangtze, the Dust Bowl, and today's Amazon basin are well known. When soils go bankrupt, nations become predatory or prop up the soil bank with other sectors of the economy. Income taxes support building waterworks to bolster nutrient flows in desert soil. Tax breaks reduce the prices of fertilizers, herbicides, pesticides, and other additives to keep the soil bank productive. The Dust Bowl, for instance, regenerated its soils with the help of petrochemical deposits.

## Natural Capital

The smart investor in the Soil Bank tracks five kinds of natural capital:

**SOIL ORGANIC MATTER** is the blue-chip stock of the soil bank. The more humus, the better the water balance, and the more bio-available nutrients

A crop speculator points out the excellent interface between plant and soil; an interface that assures that nutrient-currency flows will efficiently produce more natural capital (root mass, organic matter, corn) and artificial capital (corn futures). Photo courtesy USDA.





Mn<sup>++++</sup>

Na<sup>+</sup> Cr

for plants and microbes. The soil organic matter buffers outside threats to fertility and productivity. It was the eroded SOM account that spurred Greece to grow wine and olives.

SOIL ECOSTRUCTURE is roughly equivalent to banking infrastructure. Locally, the ecostructure is a lattice of pore spaces, which channel nutrient("cash") flows and fashion the interfaces between nutrients, the bioslimed surfaces of soil particles, and the cells of root hairs. These interfaces are like ATMs and tellers that provide friendly efficiency (or don't) to their vegetative and microbial customers.

The soil ecostructure lattice has been built from aggregated and layered clays, sands, silts, and humus. Its pipelines of pore spaces schedule events. Compacting soils with heavy machinery can squander nutrients in frozen accounts; accumulating salts can tie up nutrient funding; allowing counterfeit molecules like pesticides to circulate through the soil can ruin transactions. Some exotic currencies like cadmium can even kill the cellular-bank tellers! On the other hand, nutrient flows can be too liquid, as fugitive nutrients leave the field via plow furrows or surface wash. Harming soil ecostructure diminishes its portfolio of microbial diversity.

SOIL MOISTURE CONTENT provides liquidity for nutrient flows; creates the right environment for microbes to restructure fixed assets like cellulose and lignin into humus; and leaches out salts which, if left in the bank, would corrode the humus/capital formation. The major instrument for keeping accounts balanced is internal soil water.

MINERAL GRAINS AND CLAYS support their customer-plants by providing anchorage for their roots. Their sheer weight helps the soil bank resist deformation and erosion of the package of natural capital. Soil particles also provide the locus for the interfaces mentioned above. Mineral grains are renewable only on geological time spans, and an eroded soil bank like that of Athens cannot be restored in human scales of time.

GENETIC RESOURCES issue instructions to the cellular bank tellers to convert all kinds of fungible



nutrient instruments of commerce from one to another. Until recently, crop genetics played the most important role in setting the bank's rules for withdrawing

funds or recycling humus (with a fertilizer line of credit). In the next century, microbial genetics will alter every aspect of the soil bank.

Consider the offerings of the full-service soil bank:

The bank **circulates** its nutrient funds; by bio-cycling, it makes them more easily available to its vegetal and microbial customers. It bio-cycles plant and microbial cellulose and lignin as humus.

The bank **collects** deposits of nutrients, water, and wind-blown dusts by absorption, adsorption, precipitation, sequestering, and other tricks of the soil banker's trade. This accumulation of natural capital is priceless, and without it there would be no large life on the land. It **stores**, retains and isolates toxics that might otherwise bring down the bank. It **filters** nutrient and toxic funds through various channels (the major method of water purification on land).

Like any bank, the soil bank also **disburses** funds (sometimes to the air, sometimes to water-courses). The disbursal helps buffer differences between layers and patches of soils.

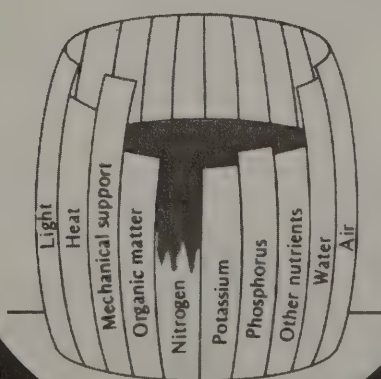
While the importance of soil as natural capital is intuitively obvious, there is no way to completely monetize soil goods and services. Some economists have tried to calculate the dollar cost of eroded nutrients, soil grains, and humus that now rest in the sea by valuing them at the cost of purchasing their equivalents (e.g., fertilizers, manufactured compost). But soil banks are much more comprehensive. They purify water, air-condition

The soil bank's ecostructure determines the efficiency of nutrient-currency flows.

Far left: A plowed, clumped soil with minimal particle-interfaces with bacteria, soil, water, and air.

Near left: Fine-crumbed ecostructure increases rate and thoroughness of nutrient/soil/water/plant transactions. Photo courtesy USDA.

Soil-bank nutrient flows limit natural capital production. In this case, water (the medium of nutrient flow) is adequate but the soil bank lacks sufficient nitrogen to prosper. Illustration from the *Nature and Properties of Soils* (see access, page 38).



H<sup>-</sup>

Zn

NO<sub>x</sub>

Cd

Ca<sup>++</sup>

H<sup>+</sup>

SO<sub>2</sub>

PCB

Toluene

watersheds, anchor living things, buffer the atmosphere, store carbon, act as the central stock exchange for foodwebs, and market electrons between living beings and mineral particles.

### The Fruit of the Land

The goods produced from soils are not solely food, fiber, and forage. They also include pigments; cosmetics; penicillin; streptomycin; anti-diarrhea, anti-indigestion, and anti-infection medicines; gravels; artificial turf; and more.

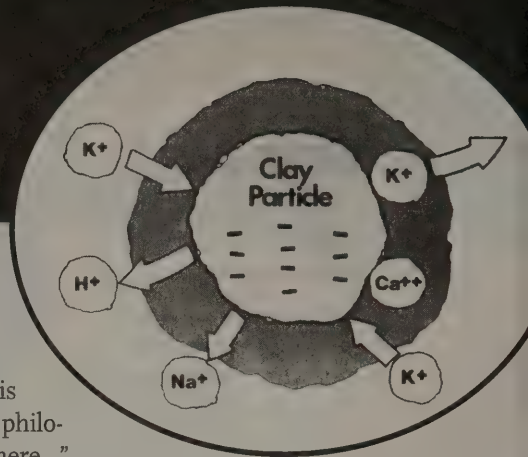
The biblical fruits of the soil have most spurred history. There were peasant societies, cultures devoted to soil, who would not leave the land and felt themselves to be not stewards, but servants, of soil. In their endeavor to raise fruits from the soil, they struggled with it, personified it, and blessed it. The diversity of soils teaches limits, the acceptance of seasonal productivity and change. Soils engender a stubborn pride in those who have weathered the joys and sorrows of wildcard freezes, storms, and floods.

Soil's disposition to be both receptive and creative takes hold of the imaginations of those who work intimately with land. Some philosophers would say that soil produces non-material values or entangled spiritual values such as humility, humane mores, and virtue (see page 25). In hunger camps, smelling famine, I have learned with Ethiopian friends to kiss even a bankrupt earth.

In the foreward to *Microcosmos* (Lynn Margulis and Dorian Sagan, 1997), Lewis Thomas explains the depth of the soil/mind/heart entanglement:

"Perhaps we have had a shared hunch about our real origin longer than we think. It is there like a linguistic fossil, buried in the ancient root from which we take our species' name. The word for earth, at the beginning of the Indo-European language thousands of years ago (no one knows for sure how long ago) was *dhghem*. From this word, meaning simply *earth*, came our word *humus*, the handiwork of soil bacteria. Also, to

teach us the lesson, *humble*, *human*, and *humane*. There is the outline of a philological parable here..."



The modern farmer cannot avoid these moments of respect. But soil has become an economic asset and investment that provides specific services to increase crop production and profit margins. Fertility is the soil bank's ability to supply needed nutrients on demand to the farmers.

Organic farmers and their customers have recently revitalized the desire to farm with more natural capital. In industrial nations, though, soil banks are flooded with artificial currencies like petrochemical fertilizers, and plow-begotten liquidity. Artificial soils lose more soil organic matter, more water-holding, and more storage capacity. Their natural-capital value deteriorates. The sand in Florida orange groves, for instance, is simply a tree-propping mechanism—a way to turn liquid fertilizer into tasty fruits. Truly an inefficient artificial soil bank. Sand-orchard currencies cause uncontrollable swings—volatilities of fertility—when washed downstream into the Everglades's waters.

All this sounds like the evening business report. It should. Agbiz has invested petrochemical nutrient-currency into an empty "bank" of sand that loses most of its funds and elasticity with each rainfall and flood. The sand bank is propped up by tariffs, price breaks, farm insurance, and subsidies. Modern soil banks, in essence, have switched from being backed by natural capital to dependence on artificial capital. Down-in-the-dirt history is just now enriching the old land, labor, and financial capital stories of both Adam Smith and Karl Marx.

I have pushed the analogy of financial and soil banks hard. Remarkably, the word games are perhaps more than analogies or metaphors; they may point toward reconvergence of the thinking of economics and ecology. We would have liked a poetic economist to write us a longer article with a playful discussion of soil discount rates, soil stock markets, eroded soil earnings, and this global corporation called Nature. It's time to dig in and find the dirty Devil in the soil-based rise and fall of empires. —PW

Soil-bank transaction at clay particle interface. Potassium (K<sup>+</sup>), sodium (Na<sup>+</sup>), calcium (Ca<sup>++</sup>), and hydrogen (H<sup>+</sup>) are the currencies exchanged. Illustration from *Western Fertilizer Handbook*, California Fertilizer Association. Interstate Publishers, Inc., 1995.

Good banking (left-most corn leaf) produces high-quality goods. Poor banking from currency (nitrogen) deficiency yields wilted, sub-quality goods. Photo from *Western Fertilizer Handbook*.



# Declaration on Soil

The ecological discourse on planet earth, global hunger, threats to life, urges us to look down at the soil, humbly. We stand on soil, not on earth. From soil we come, and to the soil we bequeath our excrements and remains. And yet soil—its cultivation and our bondage to it—is remarkably absent from those things clarified in our western tradition.

We search below our feet because our generation has lost its grounding in both soil and virtue. By virtue, we mean that shape, order, and direction of action informed by tradition, bounded by place, and qualified by choices made within the habitual reach of the actor; we mean practice mutually recognized as being good within a shared local culture which enhances the memories of a place.

We note that such virtue is traditionally found in labor, craft, dwelling, and suffering supported, not by abstract earth, environment, or energy system, but by the particular soil these very actions have enriched with their traces. And yet, in spite of this ultimate bond between soil and being, soil and the good, philosophy has not brought forth the concepts which would allow us to relate virtue to common soil, something vastly different from managing behavior on a shared planet.

We were torn from the bonds to soil—the connections which limited action, making practical virtue possible—when modernization insulated us from plain dirt, from toil, flesh, soil, and grave. The economy into which we have been absorbed—some, willy-nilly, some at great cost—transforms people into interchangeable morsels of population, ruled by the laws of scarcity.


Commons and homes are barely imaginable to persons hooked on public utilities and garaged in furnished cubicles. Bread is a mere foodstuff, if not calories or roughage. To speak of friendship, religion, and joint suffering as a style of conviviality—after the soil has been poisoned and cemented over—appears like academic dreaming to people randomly scattered in vehicles, offices, prisons, and hotels.

We emphasize the duty to speak about soil. For Plato, Aristotle, and Galen it could be taken for granted; not so today. Soil on which culture can grow and corn be cultivated is lost from view when it is defined as a complex subsystem, sector, resource, problem, or "farm"—as agricultural science tends to do.

We offer resistance to those ecological experts who preach respect for science, but foster neglect for historical tradition, local flair, and the earthly virtue, self-limitation.

Sadly, but without nostalgia, we acknowledge the pastness of the past. With diffidence, then, we attempt to share what we see: some results of the earth's having lost its soil. And we are irked by the neglect for soil in the discourse carried on among boardroom ecologists. But we are also critical of many among well-meaning romantics, Luddites, and mystics who exalt soil, making it the matrix, not the virtue, but of life. Therefore, we issue a call for a philosophy of soil: a clear, disciplined analysis of that experience.

SIGMAR GROENEVELD, LEE HOINACKI, IVAN  
ILLICH, AND FRIENDS



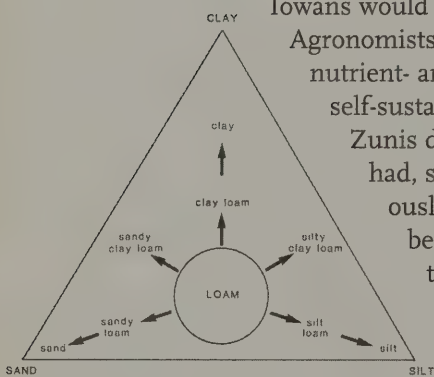
This declaration was drawn up by some participants of a meeting in Oldenburg, Germany (December 1990), held in honor of Robert Rodale and sponsored by the Niedersachsen Foundation. (Offered by Professor Sigmar Groeneveld, University of Kassel, Faculty of International Agriculture.)

# Soil-Fat & Hot

ETHNOPEDOLOGY: THE CROSS-CULTURAL STUDY OF SOIL AND KNOWLEDGE BY ROMAN PAWLUK

**W**hen I left Iowa, corn was truly king; its subjugation of the landscape was obvious, the result of an elaborate soil and crop science. I left a landscape of deep, black soil that was feeding more people (and cows) than ever before in history, and headed to the semi-arid desert of New Mexico for fieldwork with the Zuni, who live in a land strikingly different in almost every respect. Dry, windswept Zuni lands are subject to the whims of torrential rainfall that reworks the river channel soils with each sporadic event.

Iowans would consider it a harsh land. Agronomists regard its soils as too nutrient- and moisture-deficient for self-sustaining corn agriculture. Yet Zunis do grow corn here—and had, successfully and continuously, for nearly 1,000 years before they were known to the European world. I was going explicitly to investigate what the Zunis knew about the soils.



US Department of Agriculture classification of soils.

Ethnopedology, the cross-cultural study of soil knowledge, can sometimes turn basic assumptions of modern soil science upside down. Modern soil science, for instance, says that with agriculture comes a decline in soil properties important for plant growth. However, a comparison of natural and uncultivated soils in highland Peru by soil scientist Jon Sandor indicated that, after fifteen centuries of cultivation, traditional farmers appear to have improved the soil properties in their fields.

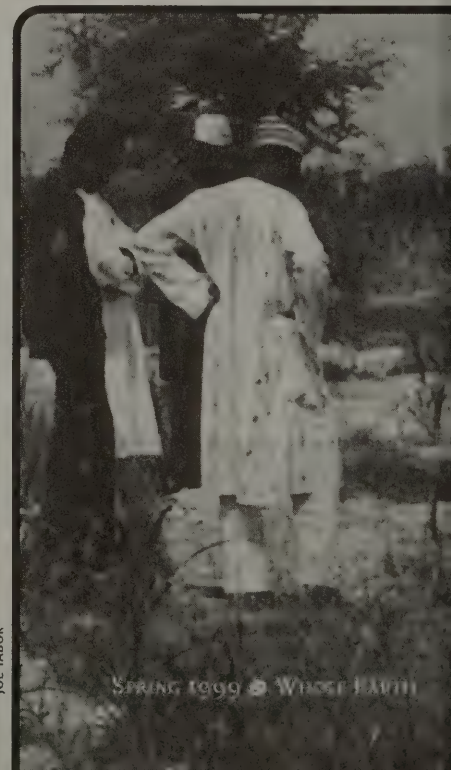
Ethnopedological studies have shown that indigenous farmers possess substantial knowledge about soils in their areas, and often use classifications that recognize differences not noticed by Western pedologists. Virtually all are based on observable soil properties and do not reflect interest—central in Western scientific taxonomy—in the systematic application of principles of geological or biogeochemical genesis of soil. They result from the combination of unique cultural views and refined efforts to solve food production problems with local soils.

In Haiti, Joe Tabor, now at the Office of Arid Land Studies in Tucson, identified “fat” soils as soils with high fertility and “hot” soils as soils that tend to drain water and dry out too fast. A classification system from India is based exclusively on the needs of farmers. It divides soils into five major groups—drought, loose, white, red, and black—distinguishing among them according to geological materials and soil texture, infiltration rate, ease of cultivation, and crop survival during drought. On the other hand, a system in Niger, where land tenure is important, employs five terms reflecting the soil’s cultivation history and three terms for locating the soil in the landscape.

A collaborative study in Peru by Jon Sandor of Iowa State and anthropologist Louanna Furbee discovered one of the most complex known local soil taxonomies, comprising fifty-five terms (forty-six of which were unique). Their work revealed a four-level taxonomic tree (see box) which distinguished between generic rock and cemented soil horizons; various layerings of soils; clays and sands; and sands and fine sands (with qualifiers for materials such as volcanic ash, salts, and carbonates). The Lari farmers had special phrases such as “rot roots” for heavy clays that held water, “water needy” for soils that drained too rapidly to grow crops, and “weak” or “lazy” for soils that needed more ash or organic fertilizer.

Jon, Jay Norton, I, and others have been investigating the soils, knowledge, and farming techniques at Zuni. Techniques involve harvesting flood runoff water and placing fields strategically on the slopes of tributary watersheds to capture flood runoff water. They help maintain a delicate equilibrium between erosion and sedimentation. As with other cultures, Zuni soil grouping

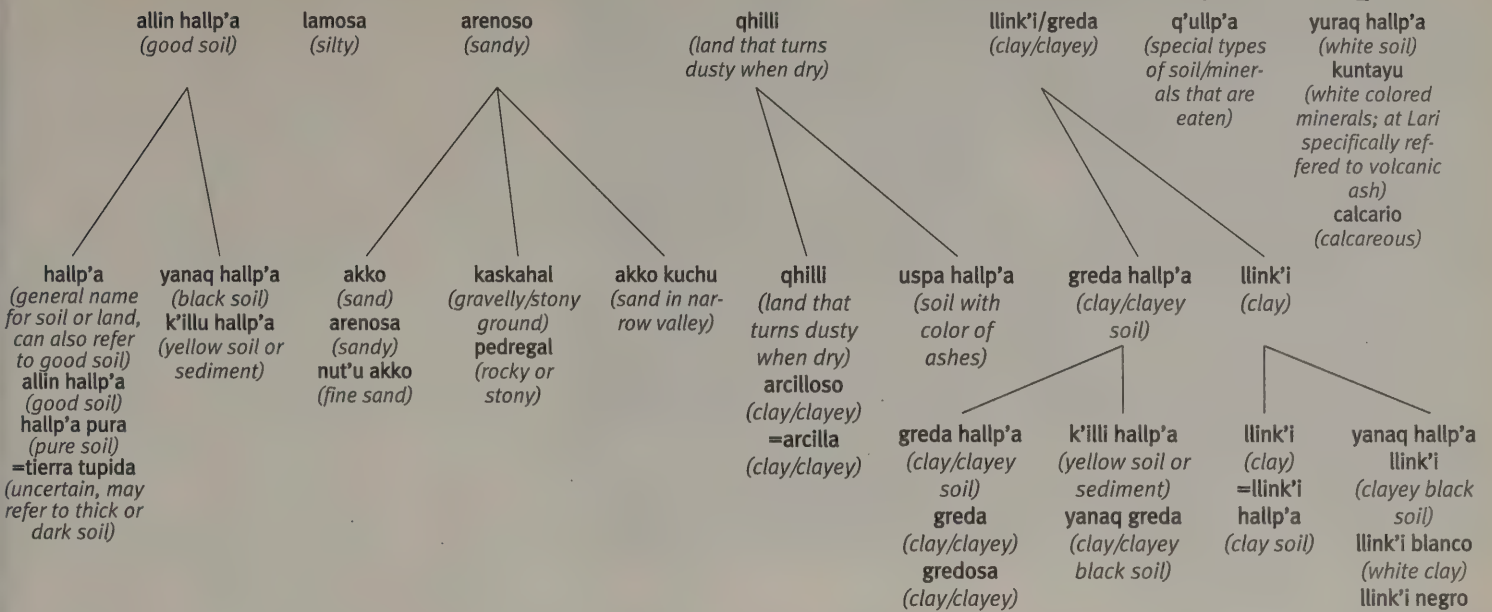
Below: Scientists and local farmers sharing soil knowledge, Niamey, Niger.



JOE TABOR

SPRING 1999 • WOODS HOLE

hallp'a  
(general name for soil or land, can also refer to good soil)



reflects criteria important to the classifiers. I identified twelve Zuni terms for agricultural soils, including *hallp'a*, a sticky clay with poor filtration, *silla*, a coarse alluvial sediment that captures water, *dilla*, an organically enriched soil from high in the watershed.

## Rethinking "Sand"

Zuni terms reflect a subtle understanding of the source and transport mode of soil parent material, its texture, and its ability to take in and hold water for crops. For example, the Zuni use a word *silla*, which refers to a coarse soil; the word translates literally as "big sand." But it means much more, and I am only beginning to understand its subtlety. It may describe, as one elderly gentleman and his son explained, a soil that has been blown onto a watershed and then washed into the lowlands. I know of no instance in Western geomorphology or soil

science of one term that includes two forms of transport.

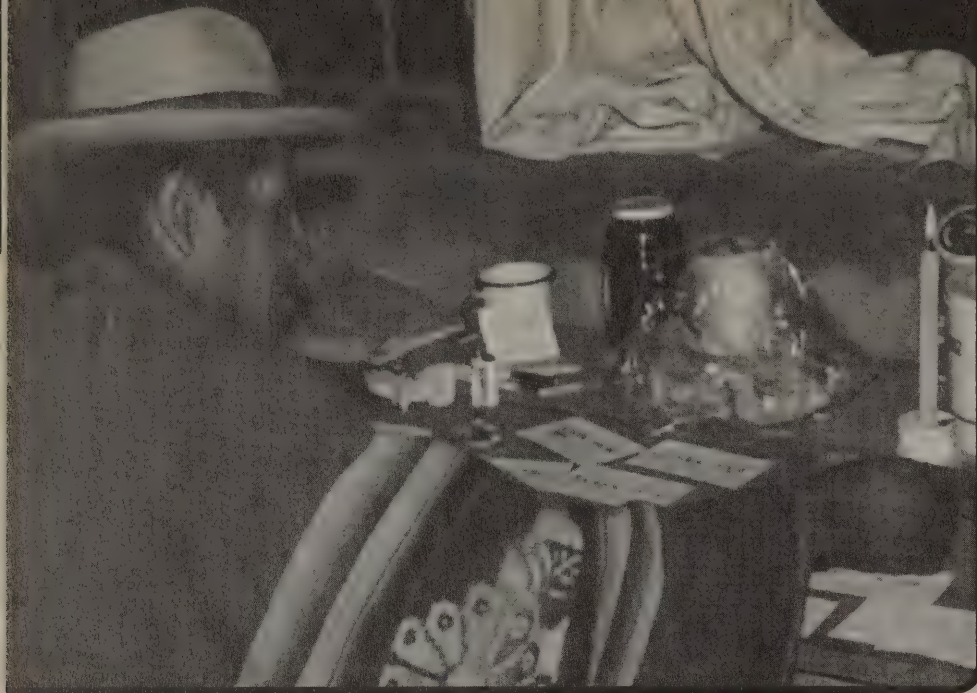
Furthermore, the word has meaning only in context. If I hold up a handful of soil and ask a Zuni farmer, "Is this *silla*?" he will say, "I don't know." I have asked a meaningless question from the Zuni point of view. But if I walk with a farmer across the lowlands where water has deposited soil from the highlands, he can tell me which soil is *silla* and which is simply alluvium, soil deposited by water.

There's more still. "Big sand" also conveys a sense of "the best." An Iowa farmer would consider coarse-grained sand to be among the worst soils, but in a water-short place where a quarter of the annual rainfall might occur in a single storm, soil that can absorb rain quickly is the best.

The English word "sand," when spoken by the Zuni, appears to reflect more than a specific range of quartz-derived mineral grains. During a meeting with Zuni Sustainable Agriculture Project members, a farmer, recalling ideas from a presentation on enhancing soils with organic matter, summarized: "...so when you add all the forest soil and manure you change the clay into sand...right?" That comment helped us clarify the fuller meaning of the Zuni use of the English "sand." To Zunis, "sand" meant, in part, a soil with good tilth (ability to be cultivated). What appears as an illogical statement from our understanding has a clear meaning in the Zuni cultural and ecological context.

Zuni soil terms have been previously published in Roman's MA thesis and *The Journal of Arid Environments*. The Zunis contacted by Roman decided these words should not be public. We honored their request by obscuring the words.





JON SANDOR

The Western classification system I learned at Iowa State developed in the context of having lots of water, fertile soil, machinery, and access to chemical fertilizers. It did not need words to differentiate between subtly different kinds of sediments at different altitudes with different fertility. It met other needs. It handled large amounts of data covering wide geographic areas, reflecting a national strategy to integrate agriculture and commerce. It arose out of a scientific culture that is guided by rationality, objectivity, and belief in universality—a faith that the same processes can be understood to apply everywhere. And it developed in a particular scientific/economic

Above: Hermágenes Cayani, a Quecha-speaking farmer from the Colca Valley in Peru, sorts Spanish and Quecha terms for different soils.

## Sand from the Forest

One wonderful moment occurred while I was speaking to a Zuni senior citizen tending his plot at a community garden. I had been trying to find a Zuni word equivalent to “fertility,” but with no success. He remarked that his wife had asked him the week before to haul from the forest a pickup load of *d[redacted]e* for her garden. This was a term I had never heard. I found out that *d[redacted]a* translates as “forest” and *s[redacted]e* as “sand” or “soil.” So *d[redacted]e* translates loosely as “forest sand” or “forest soil.” In particular, it means organically enriched soil from below trees. It means soil “good for the garden,” but is also key to the process of rejuvenating soils lower down the the alluvial fan with sediment from the forested uplands. It represents the first appearance I have found of the concept of soil fertility in the Southwestern context.

Referring to farming practices in central Mexico, Gerardo Bocco once remarked, “The main principle guiding most of the techniques” is the management of sedimentation rather than erosion.” The same applies to the Zuni. Unlike Iowa farmers concerned with reducing erosion to preserve farmland, they developed methods to accommodate erosion, build sediments, stabilize the land, and maximize productive soil.

milieu; agricultural science focused until recently on a central objective: increasing production.

No classification system is “right.” Each meets needs of its creators. At the same time, we should remember a concept forcefully expressed by Clifford Geertz: “Depiction is power.” The whole business of describing what others see and feel and do reflects our own cultural biases and is subject to relations of the dominant culture and the dominated. In the case of the Zuni and other traditional peoples, the classification system of the elders and their knowledge about sedimentation-related practices is in danger of disappearing. As the elders pass on and younger farmers adopt the language and techniques of scientific agronomists—the same “experts” who classified the Zuni land as too deficient in nutrients and moisture to sustain agriculture—the older terms fade. Seeing Western academics like us take great interest in their unique words has inspired some of the younger farmers to value and use terms like *d[redacted]e* and to believe in their forebears’ practices.

I have witnessed the opening of agricultural science to radical new ideas in the last decade. By understanding the ways Zunis and others study and classify soils, Western agronomists might learn something about how to design sustainable agricultural practices for specific locales. New approaches like ethnopedology may also, if we remain open, provide avenues for reevaluating and changing priorities in our own science. ☉

Roman works with the Navajo Nation on agriculture and flood projects for the Department of Water Resources in Fort Defiance, Arizona. This article grows out of work he did at the Zuni Reservation as part of a double-degree Master's program in anthropology and soil science (Iowa State). He spends most weekends in Zuni with his farmer friends. He would like to express his profound gratitude to the Zuni farmers and to Jon Sandor for their assistance. We add our thanks to them and to Joe Tabor. —MKS

Below: Classification by size in three different systems.

	0.002	0.006	0.02	0.06	0.2	0.6	2.0 mm		
British Standards Institution	Fine		Medium	Coarse	Fine		Medium	Coarse	
	CLAY			SILT		SAND		GRAVEL	
International Society of Soil Science	0.002		0.02		0.2		2.0 mm		
	CLAY		SILT		SAND		GRAVEL		
United States Department of Agriculture	0.002		0.05		0.10	0.25	0.5	1.0	2.0 mm
	CLAY		SILT		Very fine	Fine	Med	Coarse	Very coarse
					SAND		GRAVEL		

# Soil Tools

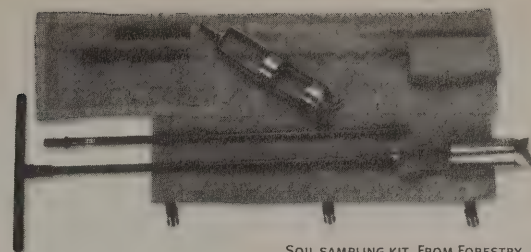
It would be a new world if every citizen knew the ground he stood upon. "Beneath my feet is a sandy loam which sits on a fractured granite"; or "My home sits on a cracking clay which rests on a mudstone shelf." Whatever your ground—urban and full of pipes, suburban and covered in turf, subrural garden, or farmland and wilderness—its concealed beauty will need some tools to reveal itself.

For toxics, there are samplers for gas vapors, PCBs, and the vadose (wet zone) chemistry in your soil. For compaction, which prevents the microbial community from functioning and can cache water, there are several tools: penetrometers (tools to measure shear stress); various kinds of shovel

(to break up the hardpan); and a special classification system (AASHTO) that stresses soil plasticity.

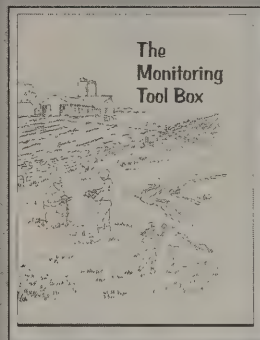
For gardens, farms, and wilderness, the list includes a wide array of "naturalist tools": soil samplers, a special color chart, and both the bottle and sieve methods of figuring soil's texture. For understanding soil moisture, there are your hands—or expensive gadgets called tensiometers and irrometers that can be stuck into the upper soil layers. There are special probes for temperature, saltiness, and acidity. Finally, for nutrients, La Motte makes special kits (available from most supply catalogs); but if you're doing tests only once every year or two, you may decide to send samples to a lab instead.

It's time to play in the dirt! —PW



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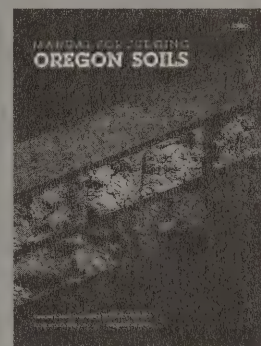
PO Box 460, Graton, CA  
95444, 707/823-9125,  
fax 707/823-1734,  
www.harmonyfarm.com.

Organic farming supplies and equipment.

### THE MONITORING TOOL BOX

Land Stewardship Project,  
PO Box 130, Lewiston, MN  
55952, 507/523-3366.

This monitoring "how-to" takes a thoughtful, teamwork approach to whole-system farmland management and soil stewardship for rural landowners. The "tool box" is a 115-page guide with companion video and newsletter. (Ours had a cassette on frogs and toads of Minnesota, too.)

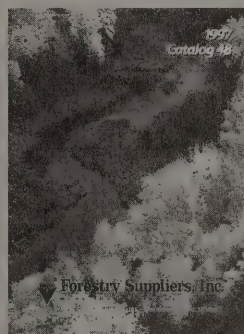


### MANUAL FOR JUDGING OREGON SOILS

Oregon State University,  
Agricultural Communications,  
Publications Orders,  
Administrative Service 422,  
Corvallis, OR 97331-2119.

### CATALOGS

The Forestry Suppliers catalog is our favorite (with good tools for reforestation), but Ben Meadows has some stuff that can't be found elsewhere.

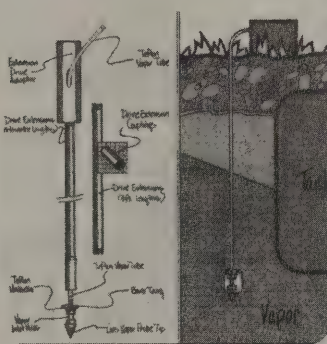


### FORESTRY SUPPLIERS, INC.

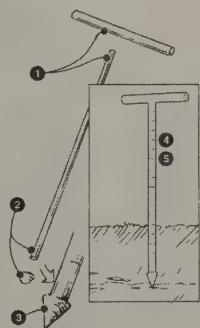
PO Box 8397, Jackson, MS  
39284-8397, 800/647-5368,



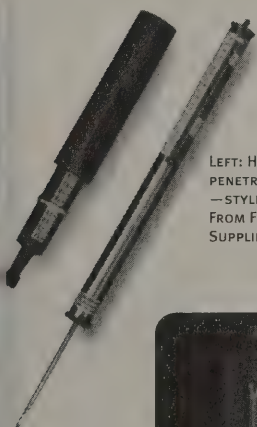
MUNSELL SOIL COLOR CHART. AVAILABLE FROM FORESTRY SUPPLIERS, INC. AND BEN MEADOWS COMPANY.



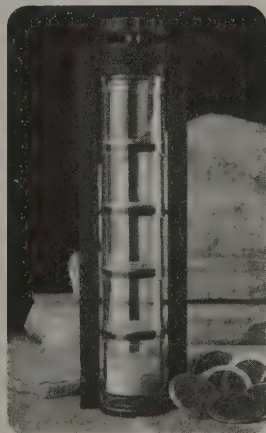
GAS VAPOR PROBE TO DETECT TOXICS. FROM FORESTRY SUPPLIERS, INC.



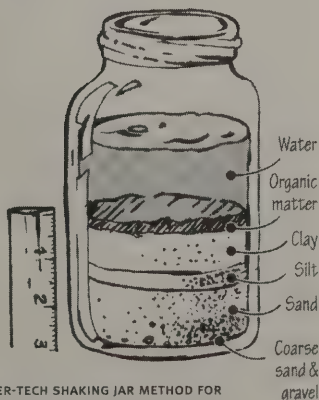
LEFT: LOWER TECH, HOME-MADE PENETROMETER — STYLE TWO. FROM THE MONITORING TOOL BOX.



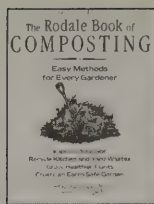
LEFT: HIGH TECH PENETROMETERS — STYLE ONE. FROM FORESTRY SUPPLIERS, INC.



HIGHER-TECH SOIL SIEVE KIT FOR SOIL TEXTURE: FROM FORESTRY SUPPLIERS, INC.



LOWER-TECH SHAKING JAR METHOD FOR SOIL TEXTURE. FROM THE MONITORING TOOL BOX.



## THE RODALE BOOK OF COMPOSTING

Deborah L. Martin and Grace Gershuny, eds. Revised edition, 1992. 278 pp. Rodale Press. \$17 postpaid from agAccess Catalog (see right).

## COMPOSTING

The single best thing you can do for your garden is to improve the soil. And the simplest way to do that is to make compost. Gardeners who want compost for their home plots will appreciate the concise, complete instructions of *Let It Rot!*

The *Rodale Book of Composting* answers almost every question you might have about the alchemy of transforming garbage into magical humus. Methods and materials are discussed, as well as how and when to use the finished product. The book includes substantial information about large-scale municipal and on-farm composting systems. —Karen van Epen

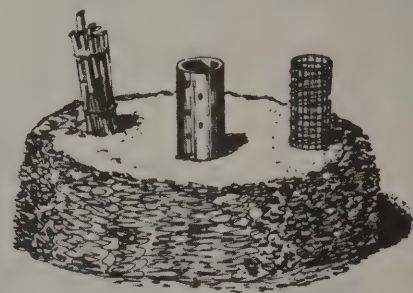
“It is not possible to stress too heavily the “soil bank account” theory of fertilizing. The real purpose of the organic method is to build permanent fertility into the soil by adding to its natural rock mineral reserves and to its humus content. Practically all the natural fertilizers are carriers of insoluble plant food. They start working quickly, but they don’t drop their load of food all at once, as does a soluble fertilizer. An insoluble fertilizer will work for you for months or years.

## LET IT ROT! The Gardener's Guide to Composting

Stu Campbell. Third edition, 1998. 153 pp. Storey Books. \$14 postpaid from agAccess Catalog, PO Box 2008, Davis, CA 95617-2008, 800/540-0170, fax 530/298-2060, books@agaccess.com, www.agaccess.com.



“You may have already heard that pregnant women and children shouldn’t handle cat litter. This is because cat droppings may contain dangerous organisms that can cause blindness, especially in children....For these reasons, keep cat droppings and litter out of your compost pile. Dog droppings also may contain disease organisms and are best avoided.



Ventilating stacks

## Bigger-Time Compost

### BIOCYCLE JOURNAL OF COMPOST AND RECYCLING

\$63/year (12 issues). 419 State Avenue, Emmaus, PA 18049, 610/967-4135, www.jgpress.com.

Emphasis on large, state-of-the-art compost and mulch operations: materials, collection, pro-

cessing, application, regulations, marketing.

### ON-FARM COMPOSTING HANDBOOK

Robert Rynk, ed. 1992; 186 pp. \$20 (\$23.50 postpaid). Northeast Regional Agricultural Engineering Service, 152 Riley-Robb Hall, Cooperative Extension, Ithaca, NY 14853-5701, (607) 255-7654, www.nraes.org.

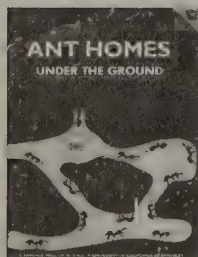
Details about setting up, monitoring, and handling large-scale compost operations.

### COMPOST PRODUCTION AND UTILIZATION

A Grower's Guide Mark Van Horn. 1995; 17 pp. \$7 from agAccess Catalog (see above).

Short and sweet for farmers. —KVE

## ANTS



### ANT HOMES UNDER THE GROUND

Jean C. Echols, Kimi Hosoume, Laine Kopp. 1996; 108 pp. \$16. GEMS, Lawrence Hall of Science (see p. 10).

From the Lawrence Hall of Science GEMS guides series, *Ant Homes* unravels differently from *Terrarium Habitats* (see review, p. 10).

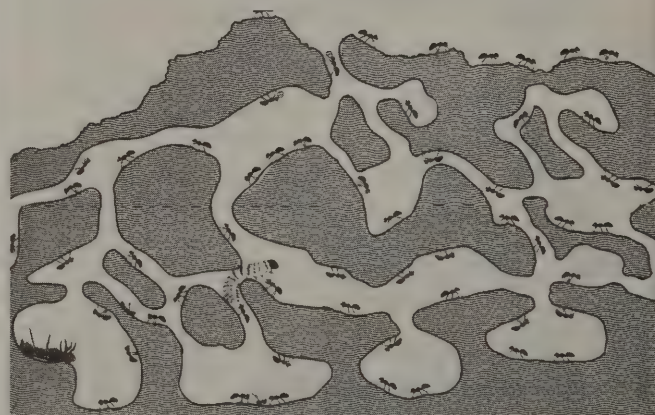
Expanding progressively on the salient point (yes, ants), peppered with creature graphics and endless variations on an ant nest, this book makes formiculture look beside the point. Geared for youngsters three to six, it's more visual and game-happy

than *Terrarium Habitats*, but provides the same in-depth background for adults. Its big black-and-white sectional poster, assembled as you work through the activities, is the prize perk. And, like its counterpart guides, *Ant Homes* plugs for gentle stewardship of the live creatures it solicits for hands-on exploration. —Nicole Parizeau

“As a class project, students construct an Ant Nest mural consisting of a network of connecting chambers and tunnels, filled with ants, ant food, and

possibly eggs, larvae, and pupae.

...The purpose of this session is to help children understand that ants work together to build tunnels to connect all the chambers inside an ant nest. By using precut tunnels and chambers (all of similar size), the children can work together to make their tunnels connect with their classmate's tunnel.





## WORMS

### WORMS EAT OUR GARBAGE

Classroom Activities for a Better Environment

Mary Appelhof and Mary Frances Fenton. 1993; 228 pp. \$24 postpaid from *agAccess Catalog* (see above).

### THE WORM CAFE

Mid-Scale Vermicomposting of Lunchroom Wastes

Binet Payne. 1999; 182 pp. Flower Press. \$34 postpaid from *Worm Digest* (see access).

### SQUIRMY WORMY COMPOSTERS

Bobbie Kalman and Janine Schaub. 1992; 32 pp. Crabtree Pub. \$9.50 postpaid from *Worm Digest* (see access).

practical advice you'll need to set up a similar project at a school near you. (You don't have to be a student or a student's parent to accomplish this.)

Curious about the life cycles of the easy-to-overlook tiny critters that surround and support you? *Squirmy Wormy Composters* presents big color pictures of worm life so amazing they could be from Uranus. These great illustrations accompany a simple introduction to vermicomposting for the early grades. —Karen Van Epen

“A cocoon forms on the clitellum of each worm. The cocoon comes off the worm over its head. As the worm backs out of the cocoon, the cocoon picks up eggs and sperm from special openings in the worm's skin.

Inside the cocoon, baby worms are formed from the eggs of one worm and the sperm of another. After three weeks, two or three tiny worms will wiggle out of the cocoon. —SQUIRMY WORMY COMPOSTER

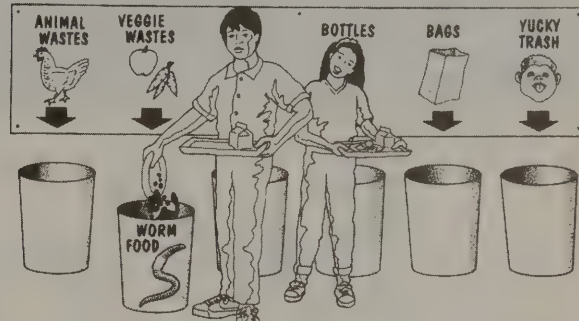
“I am not sure why we vermicomposted less food waste the second year. Students analyzed the data and suggested the difference was possibly due to a heightened awareness of how much food waste we actually produced. Perhaps knowing made them more careful about waste, and they consciously produced less. By the second year the students were growing produce for the school salad bar and were involved in the cafeteria as well. There was also a small decrease in student population. For whatever reason, we continue to vermicompost about 2200 pounds (1000 kg) of food waste in a ten-month period.

...Make peace with this bit of wisdom: no one can control all of the encountered

variables when weather, waste, worms and children are mixed. Instead, an economy of scale bestows a saving grace. Since mid-scale systems are forging to a point, they thrive when the requirements for any healthy ecosystem are met. I have found no better vehicle for teaching about ecosystems than a mid-scale vermicomposting bin.

—THE WORM CAFE

FROM THE WORM CAFE



### WORMS EAT MY GARBAGE

How to Set Up and Maintain a Worm Composting System

Mary Appelhof. Second edition, 1997; 162 pp. \$15 postpaid from *agAccess Catalog* (see above).

You have smelly organic kitchen garbage, and you want great fertilizer for your garden. What else besides composting with your muscles can accomplish this transformation?

Worms can. Their castings are prized fertilizer, and they will live in an old box by the back door (or in the basement during a freezing winter when compost heaps stop working). This book tells you how.

—Richard Nilsen

“Any vegetable waste that you generate during food preparation can be used....Spoiled food from the refrigerator, such as baked beans, moldy cottage cheese, and leftover casserole also can go

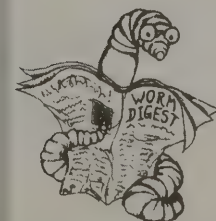
into a worm bin...enhancing the texture of the final vermicompost. Tea leaves, and even tea bags and coffee filters are suitable.

**MAGIC WORM RANCH**  
\$23.50 (Farm, \$12.25).  
Ward's Biology Supply, PO Box 92912, Rochester, NY 14692-9012, 800/962-2660, fax 800/635-8439, www.wardsci.com.

The best educational worm ranch we've found. Worms, worm bedding, and food available too.

**VERTICAL ANT NEST**  
\$19. Ward's (see access above).

Simply the best, most humane ant nest. You supply local ants and sand.



FROM WORM DIGEST.

## Wriggling Resources

### WORMS & ANTS

#### WORM DIGEST

\$12/year (4 issues). Bound set of back issues \$30. PO Box 544, Eugene, OR 97440, 541/485-0456, www.wormdigest.org.

Resources, supplies, news, and vermicomposting tales from around the world.

#### THE FARMER'S EARTHWORM HANDBOOK

David Ernst. 1995. 112 pp.

\$15.95 (\$19.95 postpaid).  
Lessiter Publications, PO Box 624, Brookfield, WI 53008-0624, 414/782-4480, fax 414/782-1252, info@lesspub.com.

How farmers are changing their tillage practices, allowing earthworms to repopulate their fields.

#### WORMWOMAN.COM

Mary Appelhof. Flowerfield Enterprises, 10332 Shaver Road, Kalamazoo, MI 49024, 616/327-0108, fax 616/327-7009, wormwoman.com.

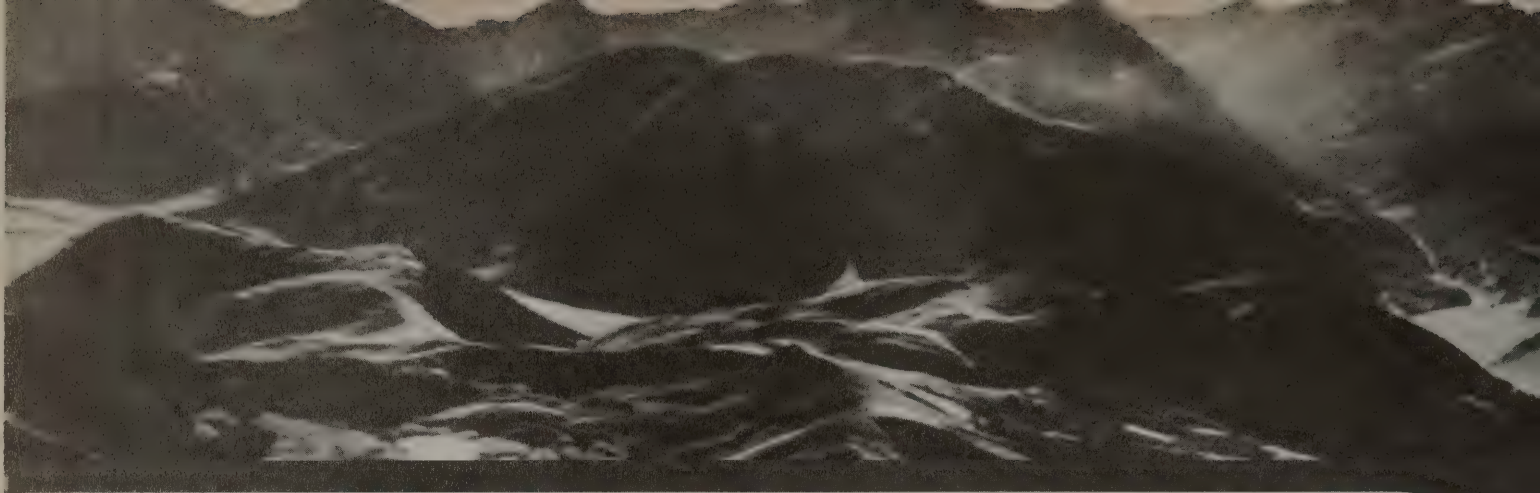
Worms and worm bins from a biologist and edu-

cator who's changing the way the world looks at garbage.

**DARWIN ON EARTHWORMS: The Formation of Vegetable Mould Through the Action of Worms with Observations on their Habits**

Charles Darwin. Reprint edition, 1976. 153 pp. \$10 postpaid from *Worm Digest* (see access above).

Darwin's classic (and, in its day, best-selling) study of the ways of the worm, at an incredible bargain price.



JOHN SHELTON. FROM GEOLOGY ILLUSTRATED (OUT OF PRINT).

# Soil-At Rest

While there are many “grounded truths,” and surely Mind, Body, or Money are valid grounds for deciphering truth, there is something quite special about the ground itself. Twenty thousand soil types make up the ground of the United States. They provide the foundation for all we do: walk, build, stand and talk, plow, motor, play soccer, and sleep. Of course, the “foundation for all we do” is also grounded in our bodies, machines, wills, and tenderness; I don’t underestimate our humanism. Yet there is that literal ground, under our feet, which would be very different if the world were one large banana peel or if we were fish or flies.

Soil’s groundedness embodies strength and surrender. Soil finds its strength ultimately resting on its hard parent bedrock, but also in its looser layers of interlocked mineral grains and bio-glued clumps (aggregates). Soil suffers weaknesses from

consisting (in a typical good soil) of about 50 percent empty space—the pore space for water and air flows. The lattice is fragile. When walking, you feel it as spongy or as crustal collapse when your foot plummets into a gopher hole.

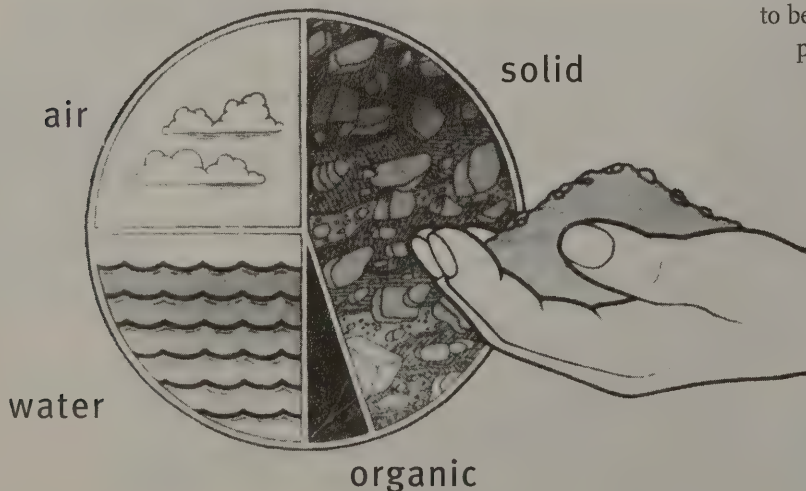
Builders of homes, roads, foundations, dams, and levees have come to view soil as looser materials on the surface of the Earth—defined by how much muscle is needed to deform it. To earth movers, soil has two major-league consistencies: tight and loose. The shovel, hoe, plow, backhoe, compactor, cat, and ripper are our major tools for forcing soil to surrender its natural-born structure and become a ground or substrate more useful to humans.

Any cellar or pond, any farm grading and ditching, and any parking lot or embankment owes its form, effectiveness, and longevity to an equipment operator’s meshing his/her skills with the muscular personas of a site-specific soil. To both earth guardians and earth movers, soil becomes a daily meditation on cohesiveness/friction (its resistance to being torn apart); hardness (its resistance to penetration); and adhesion (its resistance to separating from the surface it’s attached to).

*Cohesiveness* plays a major role in keeping soils from sliding down hillslopes after clear-cuts or road cuts. To the earth mover, loose soils—quicksands and muds, soils deconstructed by salts, frost heaves, creeping and cracking earths, landslides, and earthquake tremors—all elicit curses. The damned ground just won’t stay still (see “Moving Sand,” p. 34). *Hardness* lim-

Below: “Good” soil is considered 50 percent empty pore space (to accommodate the flows of water, nutrient, and air); about 9 percent soft-textured organic materials (humus); and about 40 percent solid grain particles all intricately latticed.

COMPONENTS OF SOIL

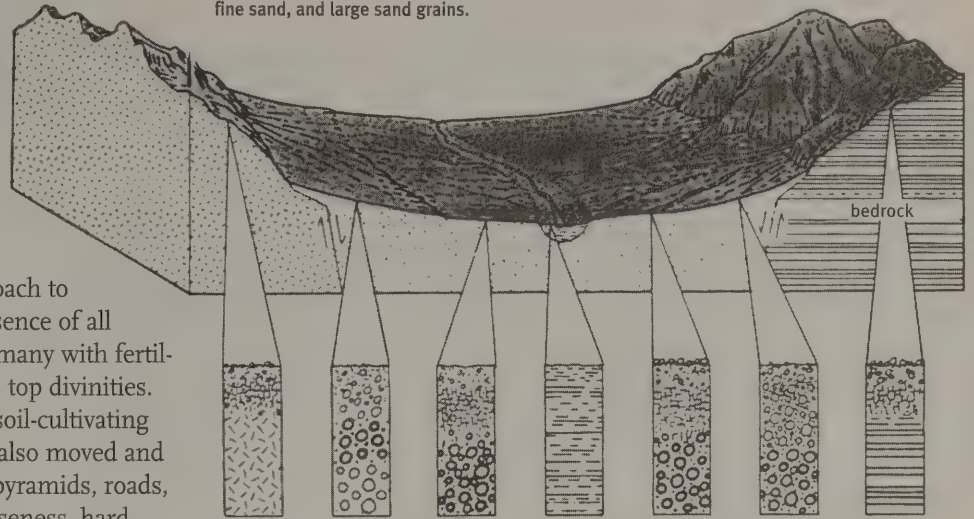


its root penetration by trees and veggies. Only plowing, hoeing, and ripping break the shallow hardpan to accommodate the deep root. Hardness is not just our problem. It constrains prairie dogs and worms. Too sandy and the burrows collapse. Too hard and tunneling's impossible. *Adhesive* soils are cherished by elephants and Californians taking mud baths, and by beauticians for facials. But adhesion is a hassle for equipment operators. Wet muds glom on to dozer blades and backhoe buckets, slowing work.

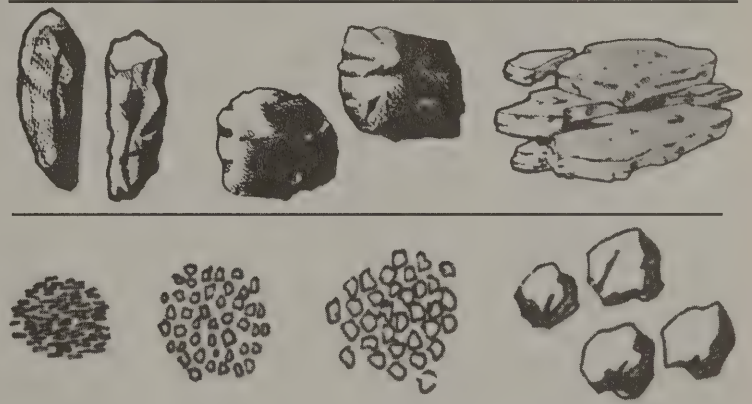
Though often considered the harsher and more masculine approach to soil, earth moving has been the essence of all agriculturally based civilizations—many with fertility goddesses and earth mothers as top divinities. These same ground-breaking and soil-cultivating civilizations, thriving on the plow, also moved and moulded soil for human shelters, pyramids, roads, and aqueducts. Soil's cohesion/looseness, hardness/softness, and adhesion/slipperiness played a spectacular role in the mentality of those constructing cities, farms, and mines. Perhaps not so coincidentally, these same soil qualities parallel the qualities most discussed by the keepers of infrastructure—priests and politicians, generals and governors—who must ponder holding society “in shape.”

How rarely we express gratitude for the strength of the ground. Machines, urbanization, and indoor education have rendered difficult any appreciation of the earth's integrity and teachings—of soil-as-infrastructure as well as soil-as-upholder-of-all-life. —PW

Top to bottom: Landscape is a patchwork of many soils, each with a different personality. The strength of each patch derives from its location on the landscape—its slope angle, wetness, age, and other factors such as the texture of layers, here shown as profiles. Note the hillslope soils are close to bedrock; the valley soils are filled with stones; and the channel soil is layers of sand and clay. Below the profiles, a more detailed view shows how soils clump. From left to right are prismatic, blocky, and platy aggregates. At bottom, a still more micro-view: the grain particles of the clumps. From left to right are clay particles, silt, fine sand, and large sand grains.

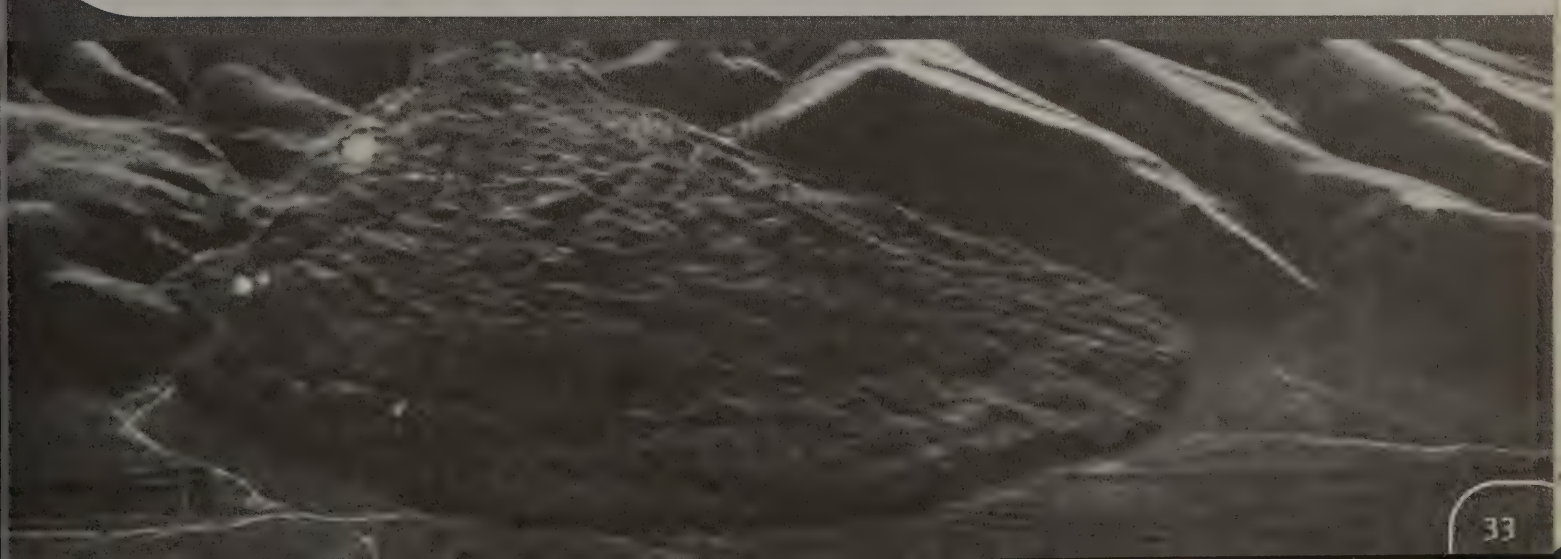


FROM ARIZONA SOILS (UNIVERSITY OF ARIZONA PRESS, 1985).



Opposite page (top), and below: Old landslide, Pahsimeroi River basin in Idaho. Soil and rock debris washed down the valley when soil strength was overcome by gravity and water.

# Soil-Moving



# Moving Sand

Life in the Limbo Zone Between  
Soil and Dunes of Granular Quartz



by Dale S. Turner

PHOTO FROM SAND, 1988. SEE ACCESS, OPPOSITE.

Sand  
creep:  
Oregon  
beach  
dunes  
swallow a  
vegetated  
slope.

**W**alking through Mexico's Gran Desierto dunes, I suddenly dropped six inches down into the "earth," neck cracking, teeth clacking, knees popping, forcefully reminded that life abounds inside stable sand dunes. It was probably the burrow of a desert kangaroo rat. Closer inspection (easy when you've just been brought to your knees) revealed abundant life in this arid sea of sand.

Julia, my geologist wife, informs me that the sand of most dunes doesn't, in the tech-

nical sense, qualify as soil. It lacks structure, layers, clumpiness, and organic material that evolve with time, climate, and soil-forming processes. But a farmer's definition of soil is simply earth material which will support rooted plants; and sand can do that admirably, though sparsely. Indeed, for arid regions which get only brief but intense rainfall, sand may be the ideal material for growing plants. Water penetrates rapidly and percolates deeply through sand's large pore space. Deep percolation protects it against evaporation from the sun's relentless heat. The "protected" water is readily available for plant life, if not too deep below the root zone. Plants on dunes are limited primarily by the effects of moving sand—most plants don't do well when their leaves are buried or their roots exposed.

And therein lies an interesting dynamic in dunes. The photogenic sand dunes by which so many people—drawn to the images of Hollywood's Sahara—are smitten, are actually the least interesting biologically. Those smooth, bare, muscular curves are formed by a fairly sterile pile of mobile sand grains. The dunes that are truly alive are those low, stable mounds covered with plants; lively dunes sit still. On them, perennial plants form islands of life, feeding and shading the whole community. Their roots bind the sand, making the dune a more agreeable place for less-adapted plant species, and help stabilize the tunnels for my friends the kangaroo rats. Their tunnels, in turn, provide shelter for snakes that prey on the rats, lizards hiding from the mid-day heat, beetles to clean up

after everything else. The stabilized surface nurtures a crust of nitrogen-fixing bacteria, providing an otherwise-scarce nutrient.

The distinction between active and stable dunes is, of course, just an arbitrary and temporary point in a continuum between the totally barren and the completely vegetated. Different parts of a dune field will often be more or less vegetated, and an area covered with wildflowers in a wet spring may be bare sand the next dry year.

So what happens when we get a string of dry years? Aerial photographs taken of the Great Plains during the drought of the 1930s show active dune crests appearing in what had previously been grass- or farmland. Large portions of the Great Plains sit uneasily on top of dormant dunes which last were active when the climate was slightly hotter and drier. A touch of global warming, and the 20,000-square-mile Nebraska Sand Hills region might reclaim its place as the largest active dune field in the Western Hemisphere (it's nearly ten times larger than the Gran Desierto of the lower Colorado, current champion in these parts).

For partially stabilized dunes in an arid climate, it doesn't take a climatic shift to get the sand moving again. Weekend warriors in off-road vehicles can do the job: smashed plants, torn roots, crushed burrows, shattered crust, and there's nothing left to hold the sand. California Highway 78, where it crosses the Algodones Dunes, provides an amazing example of this. North of the road, in an area closed to vehicles for many years, assorted shrubs are scat-

tered across the dunes, interspersed with living annual plants and the brittle debris of dead plants. It looks kind of messy, like someone's living room. Tracks of fringed lizards and shovel-nosed snakes, kangaroo rats and kit foxes, testify to the chaotic business of life in the dunes. South of the road, it's a motorized playground. Tires leave the only tracks, and the sand lies bare in huge, smooth, gleaming heaps of granular quartz. The sand is active, but the dune is dead.

So dunes teach an essential lesson: soil needs an architecture, even if frail, shaky, and weak. As its first task, a living terrestrial community organizes itself to be more cohesive, interlocked, and resistant to deformation or blowing away. With even the most transient stability, life thrives. ☪

Dale Turner just received his MA in biology at the University of Arizona (Tucson), studying lizards in the Gran Desierto. He's been a committed advocate for the sky-island ecosystems (isolated mountain ranges) that extend from Arizona to the Sierra Madre of Mexico. He has joined my spectacularly unofficial non-organization of maniacal naturalists, open only to those who survive by feasting daily on the detailed natural beauty of local ecosystems. —PW

## Dune and Sand Access

### SAND

Raymond Siever. 1988 (out of print).

Elegant and exciting. More sandstone than sandy soil life.

### GEOMORPHOLOGY OF DESERT DUNES

Nicholas Lancaster. 1995; 290 pp. \$29.99. Routledge, 29 West 35th Street, New York, NY 10001, 800/634-7064, [www.routledge-ny.com](http://www.routledge-ny.com).

Technical, tougher going, but thorough.

### DUNE COUNTRY

Jan Bowers. 1986; 156 pp. \$15.95. University of Arizona Press. (Originally issued as Seasons of the Wind.)

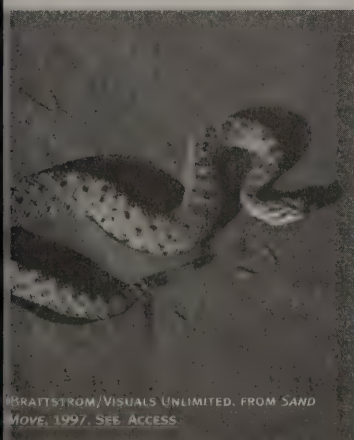
A gentle introduction to dunes by an eloquent naturalist.

### SAND ON THE MOVE

The Story of Dunes  
Roy A. Gallant. 1997; 64 pp. \$6.95. Franklin Watts/Grolier.

Slight, straightforward, and clear; for kids nine to ninety.

left: A desert sidewinder undulates across his territory. Below middle: Sand-adapted bunchgrass helps anchor one community. Below right: Native residents vie with mechanized interlopers on a fragile canvas.



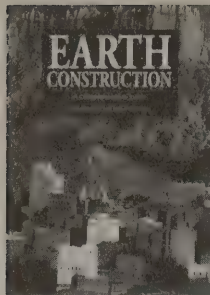
ERRATTSTROM/VISUALS UNLIMITED. FROM SAND ON THE MOVE. 1997. SEE ACCESS.



R. KNOLAN BENFIELD, JR./VISUALS UNLIMITED. FROM SAND ON THE MOVE.



ALLEN CARROLL. FROM OFF-ROAD VEHICLES ON PUBLIC LAND, 1979.



## EARTH CONSTRUCTION A Comprehensive Guide

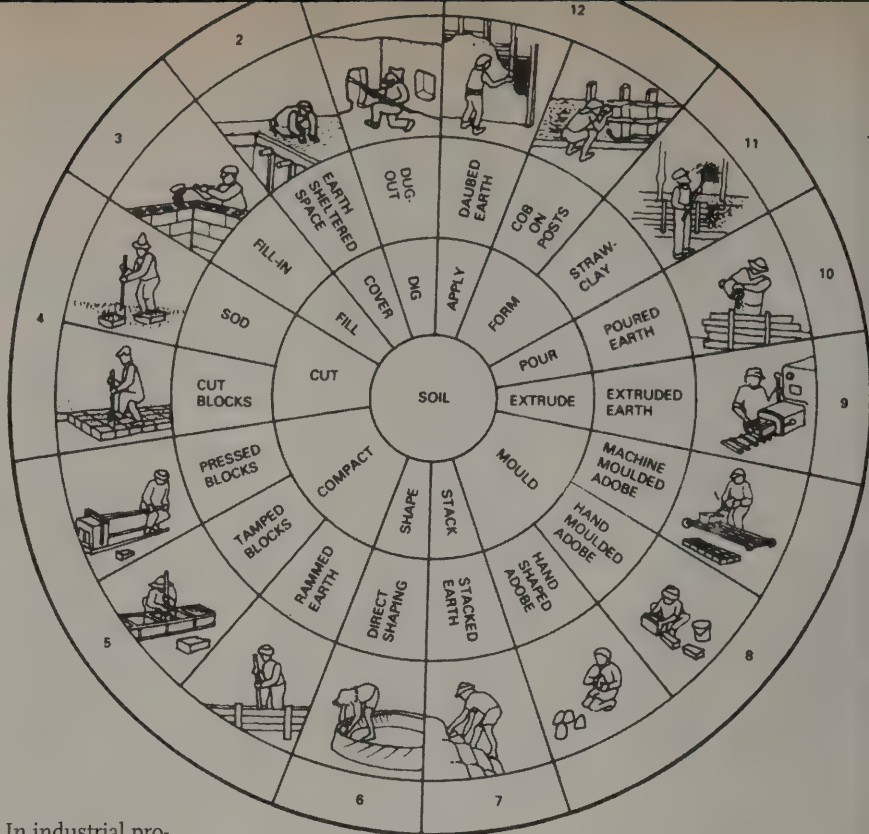
Hugo Houben and Hubert Guillard. 1994; 362 pp. £25 (£28.75 postpaid in UK). IT Publications Ltd, 103-105 Southampton Row, London WC1B 4HH, UK, orders@itpubs.org.uk, www.oneworld.org/itdg/itpubs/orders.html. In US \$47.50 (\$52.50 postpaid) from Stylus Publishing, PO Box 605, Herndon, VA 20172, 800/232-0223, Styluspub@aol.com.

Not a how-to-do-it book, but the most comprehensive global overview of how everyone does do it with myriad local soils. Unbaked earth is the handiest low-tech building material. This book reviews all manner of earth building and repair as practiced for countless centuries. Just spend time with their amazing mandala of techniques. Chapters focus on worldwide soil identification, stabilization, suitability, tests, and earth properties, as well as construction, design, disasters, and wall finishes.

Every construction method and test procedure considered in the multi-exampled text is accompanied by a clear drawing or diagram (though sometimes not clearly adjacent to each other). An astonishing quantity and variety of worldwide experience. The authors' goal is to establish realistic standards, a universal lingo, and reliable performance.

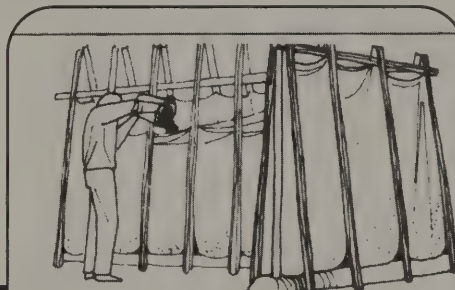
—J. Baldwin

“...in craft production, five people produce from 500 adobes (in West Africa) to 2,500 adobes (in Egypt and Iran) per day, with no investment outlay being required.



In industrial production in the USA five workers can produce up to 20,000 adobes per day, but with an investment outlay on the order of US\$300,000.

Above: Building with earth: a marriage of form, makeup, and application. Cultural needs and local conditions express themselves in twelve principal uses of earth for construction around the world.



### Left: Textiles

In this method sheets of canvas hung from frames driven into the ground are filled with earth. Units of up to 10 meters long can be produced in series and rapidly set up. The taut side bulges at its base and constitutes a structure that is highly resistant to earthquakes.



## BUILDING WITH EARTH A Handbook

John Norton. 1996; 78 pp. £9.95 (£11.45 postpaid in UK), \$19.95 (\$24.95 postpaid in US). IT Publications (see access above).

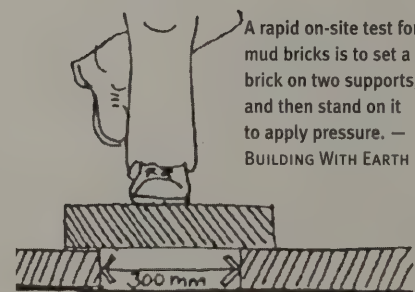
## THE RAMMED EARTH HOUSE

David Easton, photographs by Cynthia Wright. 1996; 272 pp. \$30 (\$35 postpaid). Chelsea Green Publishing Co., 205 Gates Bridge Building, PO Box 428, White River Junction, VT 05001, 800/639-4099, fax 802-295-6444, www.chelseagreen.com.

*Building with Earth* gives you the distilled field information needed for the design and production of modern earth buildings that transcend the “mud hovel” poverty image. Basic, with principles that are low-tech and apply worldwide. Not as finely focused as *The Rammed Earth House*.

Now deservedly a classic, *The Rammed Earth House* is an inspiring book that tells builders what they need to know, right down to the proper attitude and how to hold a trowel. It's a model of what a handbook should be. Only for the industrialized US, especially the US West. —JB

“The most frequently asked questions about building a house of earth are “What happens when it rains?”, “What happens in an earthquake?”, “How much do they cost?”, and “What is the R-value?” How many times have I wished I could answer, “Nothing, nothing, not much, and a lot.”—RAMMED EARTH



A rapid on-site test for mud bricks is to set a brick on two supports, and then stand on it to apply pressure. — BUILDING WITH EARTH

“Simply speaking, the best soils for building rammed earth walls are those derived from the strongest rock. Granite, which is igneous in origin, is one of the hardest of rocks. Decomposed granite, if properly moistened and adequately compacted, can be rammed back into a granite of sorts, with cement stabilization replacing the high-temperature fusion



**SPECTACULAR VERNACULAR**  
The Adobe Tradition

Jean-Louis Bourgeois, photographs by Carollee Pelos. 1996; 196 pp. \$39.95. Aperture.

Completely expanded and with many more color photos, this is one of Whole Earth's top-of-the-line, coffee-table-spectaculars. Covering the grand adobe mosques, shrines, and decorated-wall homes of West Africa and parts of Asia, this

tome exudes the care that only deep faith and spiritual joy can nurture. When I first wandered into Djenne (Mali) and saw its fluid adobe mosque rising (same color, same texture) from the earth, I felt the buzz of Chartres, and the wonderful dislocation of having the red earth year upwards in fingers into the cerulean Sahelian sky. —PW

Below: The *mihrab* (niche) in a courtyard wall in San, Mali, points the way to Mecca.



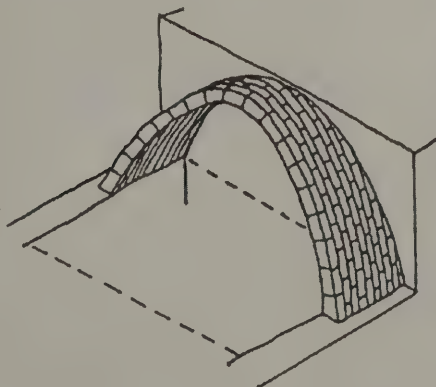
Right: Perched on a platform of stacked beds, an artist inscribes decoration into a mud plaster wall in Walata, Mauritania.



that occurs within the earth's crust. Sedimentary rock types are not as strong as igneous, but soils derived from sedimentary rock can also be transformed into very adequate and durable walls. —RAMMED EARTH

Vaults and domes can be built either with earth bricks, or entirely of earth without the need for any supporting structure, neither during nor after construction.

—BUILDING WITH EARTH

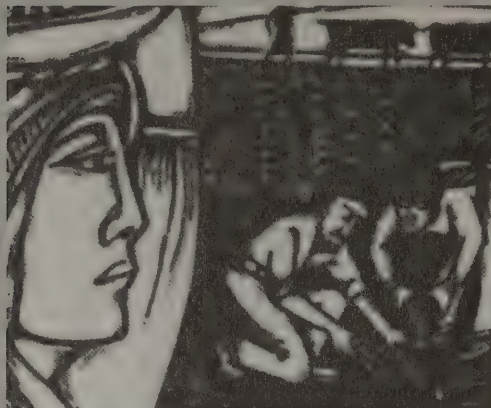


**More Building with Earth**

**The Adobe Journal**

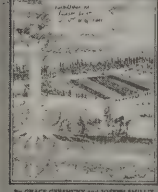
Michael Moquin, editor. \$20/year (4 issues). PO Box 7194, Albuquerque, NM 87194. 505/243-7801.

## Grounded Access: Globalocal



### THE SOUL OF SOIL

A Guide to Ecological Soil Management



By GRACE GERSHUNY AND JOSEPH SMILLIE  
2nd Edition

### THE SOUL OF SOIL A Guide to Ecological Soil Management

Grace Gershuny and Joseph Smillie. 1995; 192 pp. \$16.95. AgAccess, PO Box 2008, Davis, CA 95617-2008, 800/540-0170, fax 530/298-2060, www.agaccess.com.

A practical introduction and guide to managing soils for long-term productivity, including attention to soil health, tillage, composting, and organics. Start here.



### THE NATURE AND PROPERTIES OF SOILS

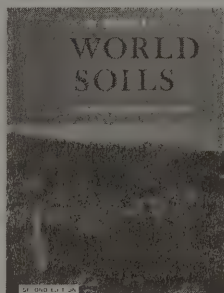
Nyle C. Brady and Raymond Weil. 1999; 896 pp. \$93. Prentice Hall.

The college textbook—stalwart, hugely revised and expanded. Whole Earth's favorite since 1974. Focuses on agriculture, gardens, and production.

### INTRODUCTION TO SOIL MICROBIOLOGY

Martin Alexander. Second edition, 1977; 467 pp. \$69.50 (\$75.50 postpaid). Krieger Publishing Co., PO Box 9542, Melbourne, FL 32902-9542, 407/724-9542, www.web4u.com/krieger-publishing.

The only book for in-depth understanding of microbial populations and species in soil, their interrelationships, and the ecological factors relating to them. Maniacal naturalists only. Technical.



### WORLD SOILS

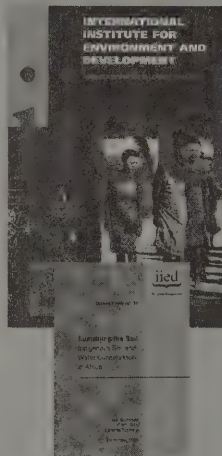
E.M. Bridges. 1978; 128 pp. \$43.95. Cambridge University Press.

No-nonsense tour through global soils. What it lacks in lyricism, it makes up for in clear definitions of soil processes, schematic readable drawings, and planetary comparisons.

### OUT OF THE EARTH Civilization and the Life of the Soil

Daniel Hillel. 1991; 321 pp. \$16.95. University of California Press.

Best in-print soil-and-history narrative. Graceful, readable global history of soil and water use, with special attention to biblical arid lands.



### INTERNATIONAL INSTITUTE FOR ENVIRONMENT AND DEVELOPMENT (IIED)

The Bookshop, 3 Endsleigh Street, London WC1H 0DD, UK, +44(171) 388 2117, fax +44(171) 388 2826, bookshop@iied.org, www.iied.org/.

The most scholarly and committed nonprofit for village-level land use and care. It publishes a variety of books and abstracts, including *Economics of Soil Erosion and Sustaining the Soil: Indigenous Soil and Water Conservation in Africa*. Publications can be ordered through most US book stores or directly from the UK.

### NATURAL RESOURCES CONSERVATION SERVICE (NRCS)

PO Box 2890, Washington, DC 20013, 202/205-0026, www.nrcs.usda.gov.

This agency of the US Department of Agriculture has mapped the soils of the US. To find your local soil map, you can call 202/447-4543 or look in the Yellow Pages® for your local NRCS office. Most college libraries keep copies.

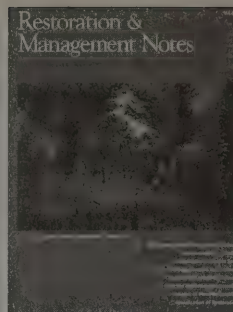
NRCS provides an array of environmental conservation resources for the public. Program topics include soil testing; erosion reduction; soil- and water-quality reconnaissance; wildlife habitat; and wetland, pasture, and farmland extension services to mitigate or protect. As a volunteer with the Earth Team (888/LAND-CARE), you can hone conservation skills and contribute mightily to resource protection in your own neighborhood.

### JOURNAL OF SOIL AND WATER CONSERVATION

#### CONSERVATION VOICES Listening to the Land

Subscription (6 issues) to either the *Journal* or *Conservation Voices* is included with \$49 membership in the *Soil and Water Conservation Society*, 7515 NE Ankeny Road, Ankeny, Iowa 50021, 800/843-7645.

*JSWC* is the best journal of semi-technical writing on preserving our natural capital. *CV* is brand new, an intelligent layperson's counterpart. (Subscription-only rate for the *JOURNAL* is also \$49; *CV*'s rate was being decided as we went to press: figure \$25–30, they say.)



### SOCIETY FOR ECOLOGICAL RESTORATION

Restoration & Management Notes

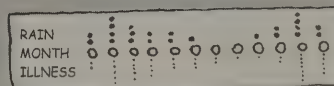
Restoration Ecology Society for Ecological Restoration, 1207 Seminole Highway, Madison, WI 53711, 608/262-9547, http://ser.org/index.html.

The Society is not just about soil but a great place to find soil rehabilitation and reconstruction ideas. *Notes* is the bulletin board, *Restoration Ecology* the academic journal. Their yearly meeting carries the drumbeat of future earth healing.

### INTERNATIONAL EROSION CONTROL ASSOCIATION (IECA)

PO Box 774904, Steamboat Springs, CO 80477-4904, 970/879-3010, fax 970/879-8563, www.ieca.org.

IECA's member resources include a quarterly newsletter (*News to Use*), a products and services directory, and six issues of the *Erosion Control Journal*, profiling the causes, prevention, and control of erosion across the globe. Membership levels vary (basic is \$25/yr).



FROM IIED



# Illustrated Man

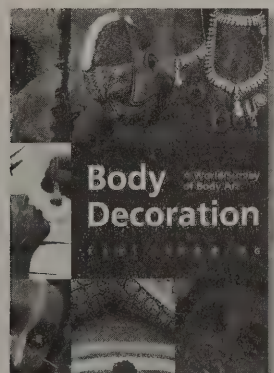
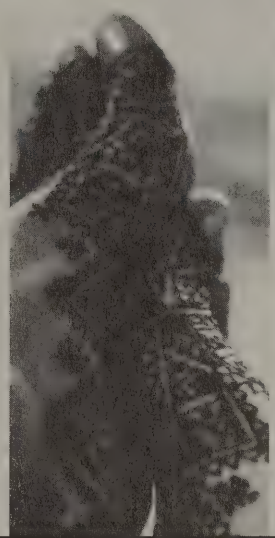
**W**e have manipulated native earth pigments since before archaeology's tracework. Our walls, our tombs, our temples, our bodies have been illustrated for millennia with variants of iron oxide-permeated earth. It's the source of the reds, ochres, and silky browns of cave paintings and da Vinci studies, of primitive burial paint and Buddhist temple-cave murals, of Egyptian tombs and the Indian Ajanta cave paintings. Most of the earth pigments derive from two of the iron ores, hematite and limonite, and almost all have a clay base. The hues are determined by the constituency of the particular iron oxide, not its degree of concentration. Ochre, that mellifluous range of color in the yellow-brown family, is made principally of clay suffused with hydrated iron oxide. Up the iron oxide, and the color becomes sienna, a translucent pigment good for stains. Sienna begs a little manganese oxide to slide into umber...and so the metamorphosis goes. Around the world, binding agents ranging from cooking grease to plant sap (to blood, for true longevity) have given these pigments their teeth, cleaving them to surfaces for all the ages. Animal fat smooths them into body creams and paints.

Top left: Prehistoric finger-painting; a mammoth drawn of clay in La Baume-Latrone. From *Journey Through the Ice Ages* (see access).

Top right: An Asaro valley "mud man," Oceania. Far right: Ethiopian Surmas prepare for a *donga* stick fight. Center: *Siyala* decorations charm the feet of a young Berber woman. All from *Body Decoration*.

Your child creates an earth pigment with every caress of a spit-swabbed finger over a dirty cheek.

Art, like all communication, is rooted in what is available. In the crepuscular light of dusk, tic-tac-toe scraped into a dusty sidewalk can rival a sixteenth-century Minoan fresco—and their lineages aren't so very far apart. —Nicole Parizeau



## BODY DECORATION A WORLD SURVEY OF BODY ART

Karl Gröning. 1998; 256 pp. \$65. The Vendome Press/St. Martin's Press.

This is seduction by aesthetics. *Body Decoration* celebrates human expressiveness on the universal canvas of skin and hair. Honoring societal benchmarks over the centuries and across the globe, this book introduces

body paints, tatoos, scarring, feathering—the body as color, design, and raw matter. Earth pigments (and makeup using earth pigments) decorate the bodies of more than half the humans depicted here. Book designer Karl Gröning, whose photographic archive underpins *Body Decoration*, has put together a lush, provocative journey whose origins and shadings are as complex as any other communication with our gods, enemies, and real or metaphoric neighbors. —NP

“Of all forms of artistic expression, body-painting is the most difficult to define. With its almost unlimited range of variations, it has been the precursor of virtually all the artistic developments that have become familiar to the people of western civilizations only through twentieth-century artists. With incredible audacity, body-painting has combined the most varied of styles...juxtaposing them, superimposing them and paying no attention to boundaries or formal moderation. [It] becomes a unifying force for everything that is within and beyond the material world.

## Earth Artistry Through Time

### Dawn of Art The Chauvet Cave

Jean-Marie Chauvet, Eliette Brunel Deschamps, Christian Hillaire. 1996; 135 pp. \$39.95. Harry N. Abrams, Inc., 100 Fifth Avenue, New York, NY 10011, 212/206-7715, fax 212/645-8437, [finnegan@interport.net](mailto:finnegan@interport.net).

The red ochre traces of a prehistoric nature drawing—the art of a 30,000-year-old society—herald the oldest known

paintings in the world. The translation is a bit stilted but the tale is a wonder.

### Journey Through the Ice Ages

Paul G. Bahn and Jean Vertut. 1997; 240 pp. \$39.95. University of California Press.

Well beyond Chauvet; a visual and descriptive panorama of Paleolithic cave art around the world.



# Divorce of the Century — Dirt and Us

It's thought—not conclusively, but by a sturdy corps of adherents—that childhood exposure to mycobacteria in soil confers the best measure of protection we have against certain allergies and autoimmune infections. In a world of shrink-wrapped broccoli and antibacterial shower mats, our immune system has increasingly less exposure to its soil-borne challengers. With no physiological learning experience, we're clean as hell—but when illness hits, we're sticking immunological daisies in the gun barrels.

To better sympathize with this desire to send us back sprawling in dirt—real dirt, not the dusts and paint flakes of urban life—it's easier to speak first of our brain and human behavior, and then of the immune system. Learning from input early in life, the brain develops along fairly determinable lines. Naively functional at birth (so we can breathe, and wriggle free of painful stimulus, and slowly bring mama's face into focus), the brain becomes increasingly sophisticated. It matures into its emotional and intellectual pathways based on the ecosystem and human contacts to which it's exposed. Starve a baby brain of language, in the critical period during which it *could* learn language, and it may never acquire the tools. Starve it of touch, and it may never develop the emotional lexicon of appropriate behavior. There is a moment in time, early in a creature's life, when the brain must receive the right signals from the outside world; or remain forever at a loss for the proper way to go.

Well, what's good for the goose may be good for all dander. In the same way that our brain myelinates, so may our immune system. In a decision "learned" early in life, our bodies can favor one of two kinds of immunoresponse tactics, depending on the degree and kind of danger. Th1 cells evolved to coordinate the assassination of the viral or bacterial enemy as it penetrates cells. Th2s appear to have evolved to isolate para-

sites (especially in the gut) and, once they're surrounded and "neutralized" by mucus, flush them out. Assassination and isolation have kept us alive. How the body perceives the situation under any given attack (i.e., which Th cells it calls to the front line) could be predicated on what the immune system learns in its formative years. What appears to be happening is that the Th2 cells are not getting the message straight. They're forming mucus and trying to isolate and flush harmless cat dander, mite feces in the suburban rug, and backyard pollen. We wheeze from allergies even absent the parasites, and may even attack the viruses and proteins with the wrong army.

What's the culprit? We've lost touch with soil, especially in infancy, say recent researchers promoting the "hygiene hypothesis." We don't smear dirt on our lips and inhale mycobacteria. We've broken the bonds of tens of millions of years of coevolution of dirt and terrestrial-vertebrate immunology. Maybe it goes back even further. No matter. Without early childhood contact with these agents in soil (and unpurified water), with every flex of our First-World fetish for cleanliness, fewer antigens enter into our bodies to rehearse the ancient immunological troops. Without certain small diseases early in life, we may have more allergies later.

Modern medicine is a long way from prescribing muck for kids. In its stead, they have two new schemes: a new kind of vaccine that stimulates both Th1 and Th2 so that your immunized child will respond as if he/she got the disease from the local ecosystem, rather than a pure strain from the pharmaceutical company; and, coming in a few decades or sooner, mycobacteria inhalers and sniffers for the special re-education of the body's military. Until then, a romp in the woods is dirt cheap.

—PW and NP

Constance Garcia-Barrio, a Philadelphia writer and linguist, teaches at West Chester University, PA. She has just finished a novel, *Jerusalem Stone*, set during a pivotal period of Black history in Philadelphia. She is working on another book with her son, Manuel.

## EAT, DIRT.

by Constance Garcia-Barrio

Say you never ate dirt? You're a plain fool.  
All the good things dirt got in it. Full of grit. Now, who can't use some? Don't be making faces at me. I know what I'm talking about.  
Dirt got sunshine in it. Years on end of light in a mouthful.  
And dead folks is in the dirt, just a-talking and a-dancing. Swallow some, and they'll tell you things. You'll get a old folks mind in a young folks heart. Help you step clear of trouble.  
And moles gone through the dirt so the dark won't feel strange to you no more.  
Don't look at me funny. Better take your ears out your ass and listen. Dirt got God's tears in it.  
Me, I eat dirt regular. Every other day. Dirt grows sweet corn and trees big as houses. Just think what it'll do for you. Better eat you some dirt, honey, and see what grows in you.

SOURCE:  
FOR THE REAL  
SCOOP, SEE  
"GIVE US THIS  
DAY OUR DAILY  
GERMS," BY  
GRAHAM A.W.  
ROOK AND  
JOHN L.  
STANFORD.  
IMMUNOLOGY  
TODAY, VOLUME  
19, MARCH  
1998, P. 113.

# Eating Earth

WITH THE GENEROUS ASSISTANCE OF JOHN M. HUNTER, PH.D. ALL PHOTOGRAPHS BY JOHN M. HUNTER

**E**ating earth (geophagy) is universal. You do it in a refined manner each time you chug Kaopectate, Di-Gel, Roloids, Mylanta, Maalox, or Donnagel-PG. In essence, diarrhea and acid-stomach upset are keeping alive a now culturally concealed taste for earth. In these products, the active ingredients of clays (kaolin) or certain earths (calcium carbonate) have been isolated from the earth mass, but that slippery, earthy feel still stays in the mouth.

Geophagy (JEE•AW'•FA•Y) spans the material-to-spiritual spectrum. Bioregionalists would love a Siberian tribe that once carried small balls of local earth on their wanderings. They nibbled them along the way, the taste a reminder of home. Among Mayan (and now mestizo) communities of Central America, eating clay tablets combines healing, devotional reminders, blessings from Our Lord of Esquipulas (the Black Christ), good fortune, devotion, and pregnancy nutrition (see photos). It has been said in Sri Lanka for 60,000 years that the sole food of Brahma (the originator of all being) was the earth itself.

Swedish and Finlander grandparents still tell stories of clay bread used as an extender (and perhaps for some nutrition) in famine breads. Among the Ainu people of Japan, a special recipe for clay-lump soup was probably a nutrient supplement, a

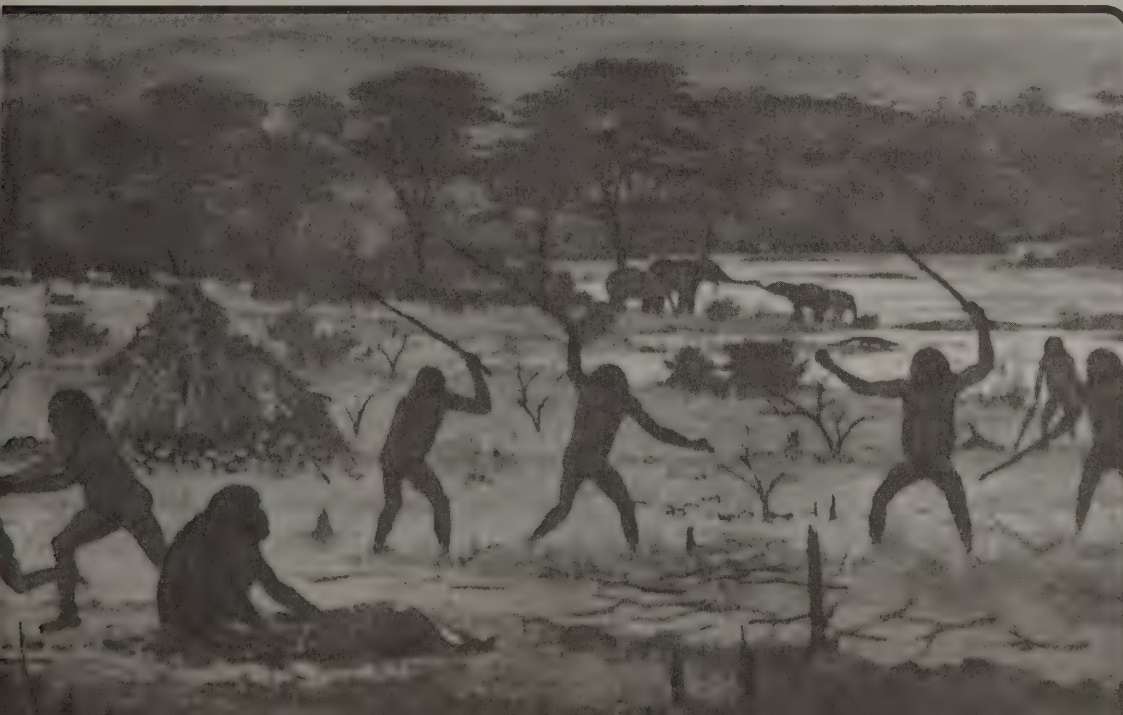
good-tasting hunger reliever. In Africa especially, but all over the world, women turn to special earths to help provide minerals (especially calcium) during pregnancy. Mende and Kissi women of West Africa gather special earths that have been processed and concentrated by termites (see photos). In Java and Sweden, a special wetland clay filled with near-microscopic invertebrates (Infusoria) is a prized micro-food. To counteract toxins and poisons, the Aymara of Peru made a neutralizing clay dip for feral potatoes that belong to the poisonous nightshade family. "Oak peoples" who eat large quantities of acorns can either leach them or mix them with clay to neutralize the tannic acids. From California to Sardinia, acorn-meal/clay breads still survive.

Not all earth eating is great for you. It can calm hunger without satisfying nutritional needs. It can eventually line the intestines and prevent nutrient absorption. It can become an addiction and a form of anorexic suicide. It can disturb the balance of potassium when abused. But by long and honorable tradition, seeking solace or nutrition from eating earth plays a critical cultural role all over the world.

In short, earth eating fulfills a global human desire for famine food, medicine, nutrition, poison buffer, or spiritual reminder. No individual clump needs all these attributes; one fulfilled desire is reward enough from any given piece of the good earth. —PW

John M. Hunter is Professor of Geography, Community Health Science, and African Studies at Michigan State University.

Captions by  
Nicole  
Parizeau



## **Homo habilis**

We can only surmise the story behind the discovery of a highly unusual white clay beside prehistoric remains of *Homo habilis* at Kalambo Falls, Zambia. Tens of thousands of years before the birth of clay crafts, this ancient hominid clearly had a relationship with clay. And not just any clay; this particular material is not indigenous to the area—it was deliberately carried there. In fact, it's precisely the type of clay earth eaters have sought most—call it "brand loyalty"—since geophagy made its first recorded appearance. Was *Homo habilis* eating clay for her health? To massage a pregnancy along? Was she just famished?



## The Clay Eaters of Esquipulas

From Mexico and all parts of Central America, one million pilgrims a year climb into the hills of eastern Guatemala to commune with the shrine of the Black Christ, the Crucifix of Our Lord of Esquipulas. The 400-year-old carving, powerful heart of the shrine, fuses both Mayan and adopted religions. The holy clay tablets of Esquipulas have been formed from the springs and quarries surrounding the shrine since before the arrival of Christ. No stage of the process—mining, making, buying, blessing, or eating the holy clay tablets—is unattended by faith.

The clay is typically mined by the men and crafted at home by the women, in a laborious, unmechanized process. After painstaking fabrication, the tablets are marketed by shrine-side vendors and regional wholesalers. It is an economy bringing meagre returns to the poorest of the poor Guatemalan villagers in the hills surrounding the shrine.

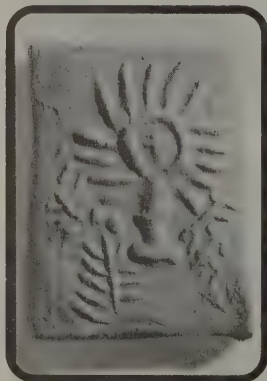
The tablets are eaten almost exclusively by women to induce or nurture pregnancy, but are imported for everything from shipwrecks to divorce. Pilgrims who buy tablets from vendors at the shrine often take them immediately to be blessed at the basilica, clinching their potency.

The clay's components embody pragmatic rewards, and may well rival contemporary pharmaceuticals for calming upset stomachs and providing needed minerals. But for believers, from the miners of the *tierra blanca* to the final earth eaters, the gestational, dietary, or emotional benefits of these holy tablets lie squarely in their attachment to the shrine. Faith, not empiricism, drives the geophagy behind Esquipulas.



### Earth Eating on the Move

Satellite shrines, along the route to Esquipulas, evolved from Panama to New Mexico. As travel to the original site in Guatemala became prohibitive, new shrines arose, disconnected from Esquipulas. New shrines sometimes neglected their origins, taking the names of the towns in which they were built.



**SOURCES:**

HONEY, MUD, MAGGOTS AND OTHER MEDICAL MARVELS, ROBERT AND MICHÈLE ROOT-BERNSTEIN (SEE WHOLE EARTH No. 91).

"MACROTERME GEOPHAGY AND PREGNANCY CLAYS IN SOUTHERN AFRICA," JOHN M. HUNTER. *JOURNAL OF CULTURAL GEOGRAPHY*, VOLUME 14, NUMBER 1, 1993.

"RELIGIOUS GEOPHAGY AS A COTTAGE INDUSTRY: THE HOLY CLAY TABLET OF ESQUIPULAS, GUATEMALA," JOHN M. HUNTER, ET AL. *NATIONAL GEOGRAPHIC RESEARCH*, VOLUME 5, 1989.

"GEOPHAGY IN CENTRAL AMERICA," JOHN M. HUNTER AND RENATE DE KLEINE. *GEOGRAPHICAL REVIEW*, VOLUME 74, NUMBER 2, 1984.



**Termitarium Earths**

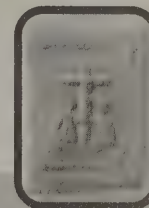
Geophagy is widespread among pregnant women in much of rural and village Africa, where earth eating's palpable nutritional benefits are unquestioned. Termite mounds—the masticated-earth homes of insect colonies, sometimes soaringly tall—are particularly sought out by pregnant women. The perpetual overturning and enrichment of the earth by termite activity make the clays found in these mounds especially mineral-rich—there may even be some enzymatic benefit from their saliva, liberally dispensed in the construction process. Cattle seek out these termite clays as avidly as do people.

**Mouth Locks**

Horrified by a practice they didn't understand and would not tolerate, plantation owners of the American colonies and West Indies implemented a cruel and misguided form of "therapy" for geophagy by their slaves: they fitted them with mouth locks. The slaves may have had iron deficiencies (many had sickle-cell anemia) or, needless to say, earth eating may have been a form of self-starvation, a pathology born of relentless cultural genocide.



FROM ANTISLAVERY: THE CRUSADE FOR FREEDOM IN AMERICA. DWIGHT LOWELL DUMOND, 1961. OUT OF PRINT.



**Edible Clays Access**

We're still eating earth; here are a few makers of products using clays for internal consumption.

**Yerba Prima, Inc.**  
740 Jefferson Avenue,  
Ashland, OR 97520,  
800/488-4339, 541/488-2228, fax 541/488-2443,  
yerba@yerbaprima.com.

**Naturade**  
7110 Jackson Street,  
Paramount, CA 90723,  
800/367-2880, 562/531-

8120, fax 562/531-7748,  
www.naturade.com.

**Rainbow Light Nutritional System**  
PO Box 600, Santa Cruz, CA  
95061, 800/635-1233,  
831/429-9089, fax 831/429-0189.

**Good N Natural**  
90 Orville Drive, Bohemia,  
NY 11716, 800/544-0095,  
562/531-8120, fax 562/531-7748.

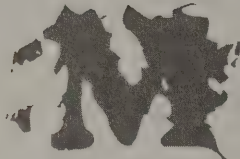


Edible clay "cakes," Accra, Ghana.



# Earth Alive

BY WILLIAM BRYANT LOGAN



The Chinese ideogram *Kun*. The character *tu* (earth) stands on the left. A powerful vertical stroke (extension) cuts through middle of the ideogram. *Kun* is variously translated as Submission-and-Extension (as in cultivating soil); the Passive Principle; the Receptive; or the Responding. Flexibility, devotion, and humility have always been associated with soils and toils.

atter is Potential, wrote Thomas Aquinas, and God is pure Existence. As abstract as this terminology may sound, it is simply based in the knowledge of the relationship between the fruitful soil and the fructifying sun. It is identical with the Taoist idea of Yin—the passive principle—as describing first and foremost the action of the Earth, and Yang—the energetic principle—as describing first and foremost the action of the Sun. Every ancient Chinese farmer or medieval householder would have understood these ideas more viscerally than most of us do, because they still sowed seed, exposed it to the sun and the weather, and reaped what came out of the ground. Furthermore, until our time, people had ritual help remembering the meaning of the soil.

In his *Encyclopedia of Religion*, Mircea Eliade described earth as “the generative source of all terrestrial manifestations of existence.” Since the Neolithic at least, hardly anyone would have disagreed with him. The generative connection was felt so intimately by some peoples that it had to be ritually enacted by men and women before a field was able to lose its virginity and begin to bear. In ancient Japan, the emperor himself had to make love to a virgin on the open fields before the fields could be planted. Likewise, among the Oraons of Central India, a priest and his wife had annually to renew the cycle of growth by copulating in the fields. To the Navajo, Earth was Naetsan, the Reclining Woman.

The European past, too, was full of such rituals, until fairly recent times. Indeed, common English names like Robinson, Johnson, and Jackson refer ultimately to children conceived on nights of spring and summer festival revelry, when men and women made love freely in the forests to enact the soil’s arising from its winter slumber. Robin Goodfellow was the sprite who

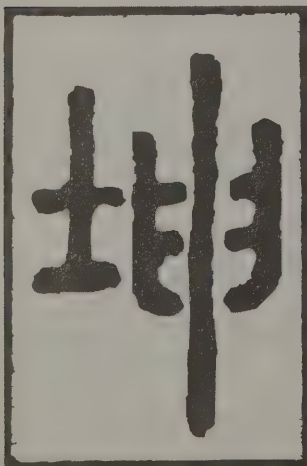
presided over these popular mysteries, and Little John, Little Jack, or Little Jenkin was the chief of his accomplices. It is not that people were more licentious then—indeed, as a rule, adultery was severely punished—but on the ritual days, promiscuity was not only tolerated but decreed.

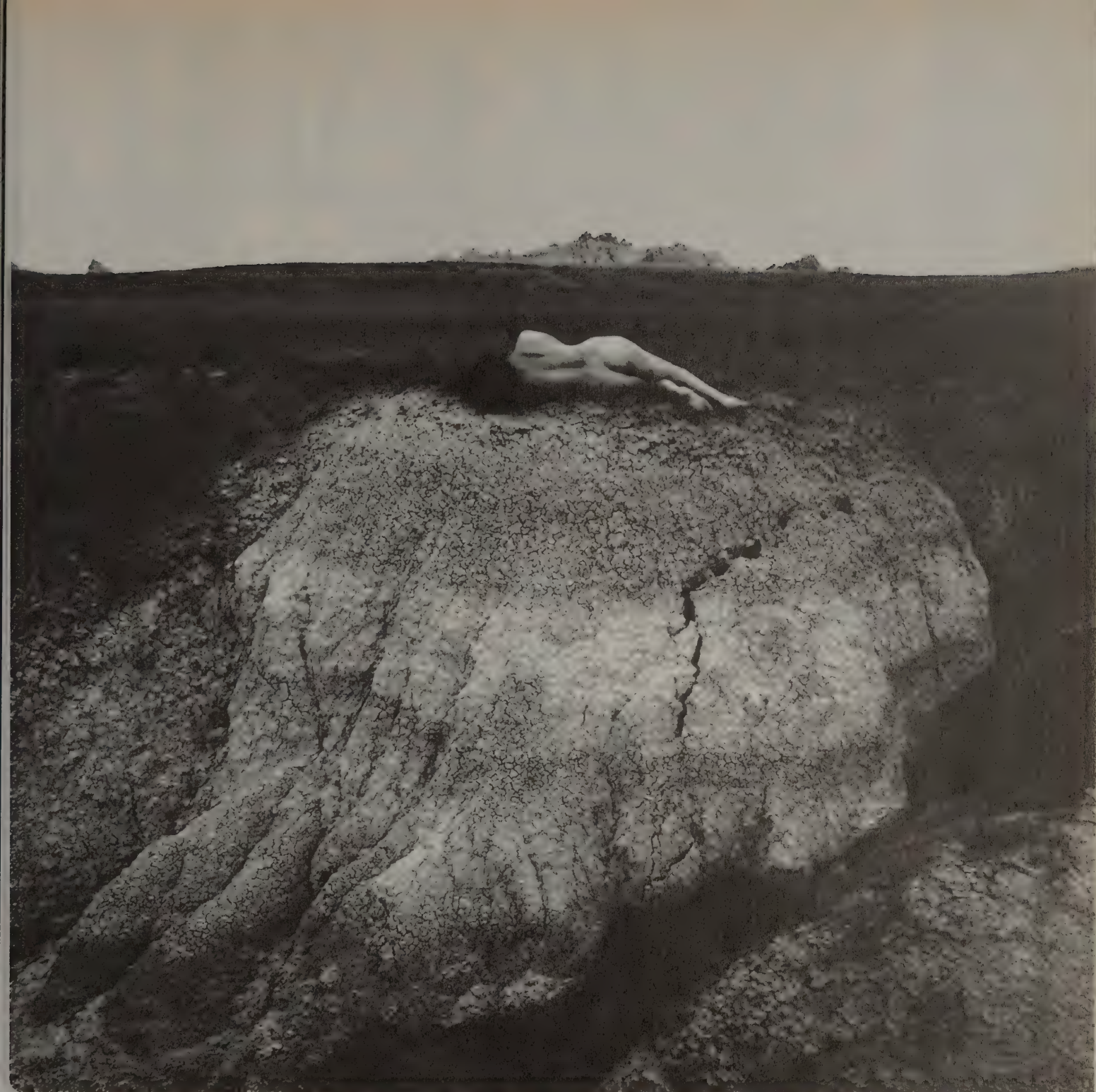
Cultures around the world have also prescribed rituals to bring the fruit of human unions into direct contact with their native soil, at birth. Sometimes, this might be done with refined products, as when Henry II of France rubbed the lips of his newborn son with the garlic and wine of his native Gascony. Often, it was done directly, the mother actually squatting to bear her child on the soil itself. The Egyptian hieroglyph for childbearing, in fact, shows a woman squatting on the earth.

In pastoral and agrarian cultures from Africa to China, there are remarkably similar rites in which the newborn child is first deposited on the earth by the mother and the midwives, then picked up by the father. The mother, as representative of the receptive principle, places the fruit of her body on the skin of our common mother. The father, as representative of the active principle, lifts the child up towards the sun, gives thanks for its safe arrival, and initiates it into the human community.

Sometimes, the rituals of the soil are even prescient of what has since become scientific knowledge. The Pueblo peoples of the American Southwest all imagine humans as having been created inside the earth and having climbed out into the light, like plants that grow from seeds. This myth of origin is remembered and reenacted in the kiva, a religious structure that mimes an underground cave, complete with a ladder for emerging into the open air.

In several of the origin myths, human beings are represented as emerging gradually from four different wombs of Earth. The deepest of these wombs is the mineral realm, where processes take place very slowly in utter darkness. In the two intermediate wombs, there is progressively more light, more room, and faster motion. In the uppermost womb, it is almost daylight in what seems to be a large cavern, but here there is such a crowd that soon the most adventurous must emerge into the real light of day.





© 1981 JUDY DATER, "SELF-PORTRAIT, BADLANDS."

This progressive creation can surely be interpreted on many levels, but to a soil scientist it is fascinating that the four wombs could well be read as the four horizons of natural soils: lowest is the mineral or "R" horizon, where the rock has just begun to crumble, liberating its nutrient compounds and admitting water and a little air; next is the "C" horizon, where crumbled rock, meeting the

most deeply leached elements from the surface, begins to form the complex matrix of a real soil; third is the "B" horizon, where leached calcium and organic matter actually serve as storehouses of needed nutrients; and, finally, comes the organic-rich "A" horizon, where microbial activity, air, water, and minerals all combine to make possible the gestation of seeds and the growth of all terrestrial life. ☉

If soil has a poet laureate, it's William Bryant Logan (see *Dirt: The Ecstatic Skin of the Earth*, p. 11). Writer of a monthly column, "Cuttings," for *The New York Times*, and former writer-in-residence at the Cathedral of St. John the Divine, he works with the Gaia Institute and the Lindisfarne Fellows, and teaches at Columbia University. He wrote "What is Prosperity?" for WER No. 86.

# BLACK SELF-

by Wendy Ewald

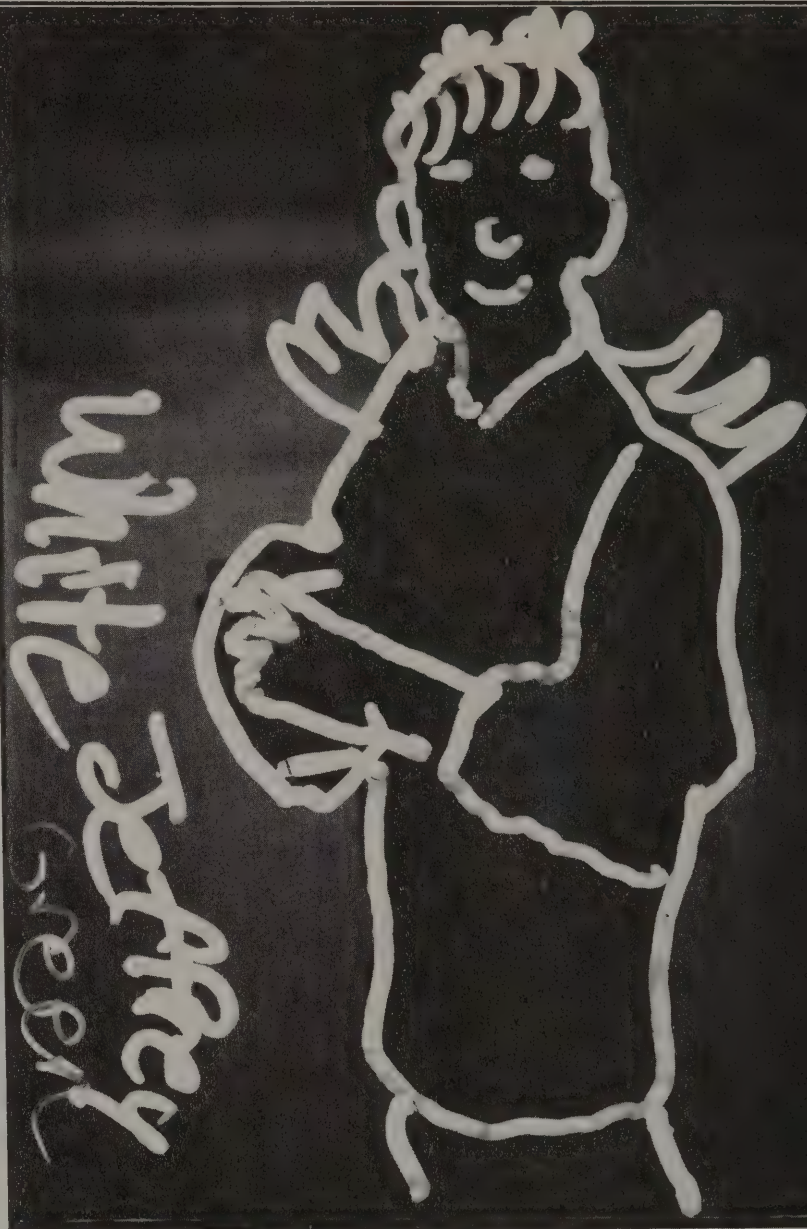
In 1989, the public schools in Durham, North Carolina, asked me to implement a program I'd developed that uses photographs as a starting point for creative writing. I began by teaching in three classrooms, two in what was then the Durham City Schools and one in the Durham County Schools. Over the last two decades, as more and more of Durham's white population moved to the suburbs, the schools became segregated along city-county lines. Proposals to merge the systems were stymied by objections from both sides. The African American children I worked with had never attended school with whites and many said they preferred it that way. I sensed that race, although an important issue for the children and teachers, was seldom talked about.

In 1992, the Durham school systems were finally merged. In 1994, two gifted teachers helped me on a new collaborative project I designed to look at race directly. Cathy Fine, a white fifth-grade teacher at Pearsontown Elementary School, and Robert Hunter, an African American art teacher at Shepard Middle School, asked their students to write detailed self-portraits. Then we asked each of them to write another self-portrait, this time imagining themselves as members of the other race. At first we were met with silence, then laughter, and finally an enthusiastic barrage of questions: Could they change their names, their families? How could they know what it was like to be of a different race?

Ms. Fine's class was racially mixed, so the stu-

dents were able to pair up and interview each other. Mr. Hunter's class, however, was entirely African American. One of his students, Damien, decided to write his portraits inside the outlines of faces he'd drawn to emphasize the difference between his two selves.

Once the students completed their written portraits, I photographed them posing as their "black" and "white" selves, using props they'd brought from home. I gave them the large format negatives to alter or write on, using ideas from their written portraits, so they could further describe their



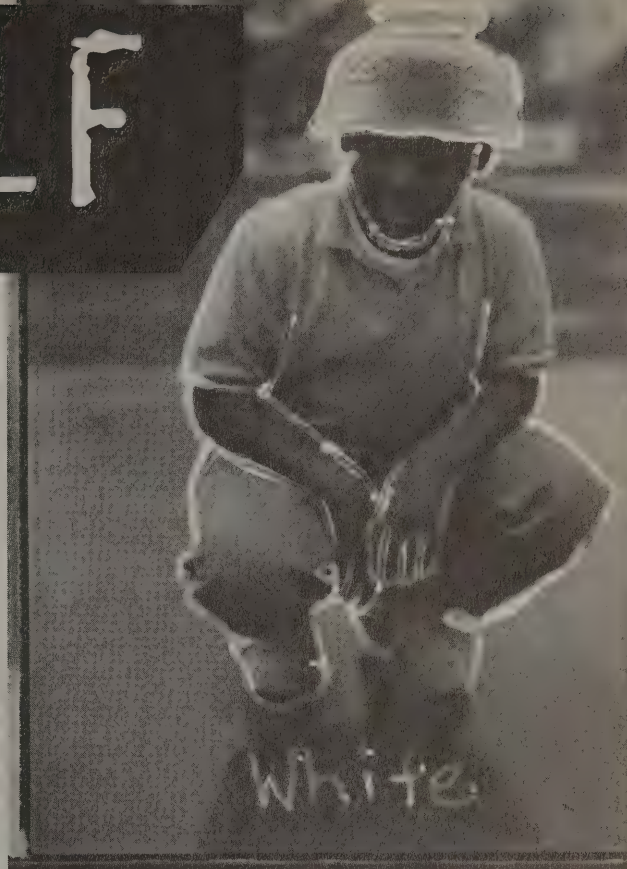
MICHAEL GREENE AND WENDY EWALD



# WHITE SELF

characters. For the students the idea of transforming the photographs and their own physical features was exciting and challenging. They had to think hard about scratching the negative image in order to produce a black line or adding a black mark on top of the emulsion to make a white line. In this way, negative and positive and black and white took on a meaning that was both conceptual and physical.

It was difficult for some of the students to visualize themselves as the "other." Since the white children rarely dealt with the black world's perception of them, they had almost no idea of how to pose; some of them asked the African American children to direct them. The African American children never needed such coaching: without saying a



ZAVIER VEREEN AND WENDY EWALD

word, Antonio slumped over in front of a white seamless background and covered his head to represent what he explained was his white persona—homeless, without a community.

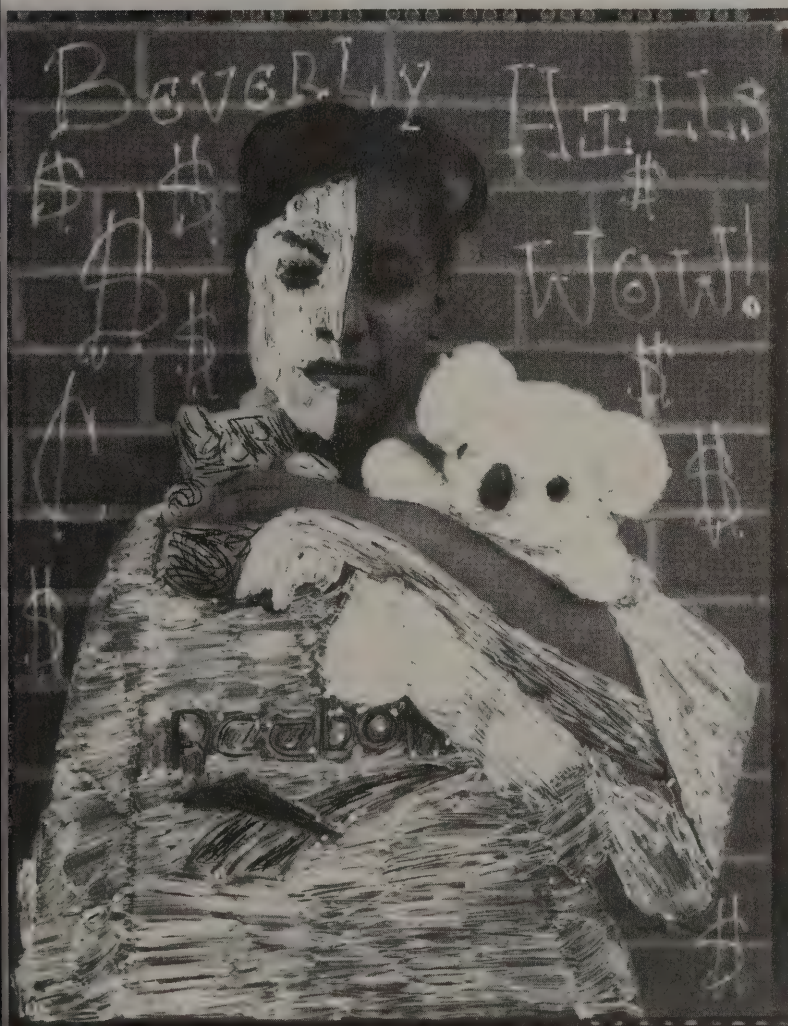
It became clear to Mr. Hunter and me that the African American children had a clearly defined sense of how white people saw themselves and how they were seen by white people. Sometimes they internalized this image, as when they talked about their white selves being "nicer" or "smarter." Rachael, an African American sixth-grader, told me she put all her dreams for the future into her white self. As for the white children, they seemed almost naively optimistic. Chris, a white fifth grader, said he imagined himself as the first black president. ☉

## Sheldon, Eighth Grade

*African American writing as himself and as white self*

Me: [1] Funny, [2] Nice, [3] Smart, [4] Playful, [5] Happy, [6] Mad, [7] Angry, [8] Helpful, [9] Sleepful, [10] Handsome, [11] Strong, [12] Tall (as in confidence), [13] Creative, [14] Good Listener, [15] Dependable

White Me: [1] Corny, [2] Smart, [3] Nice, [4] Playful, [5] Weak, [6] Country, [7] Too confident, [8] Too tense, [9] My name "Billy Bob," [10] Get better jobs, [11] Be a vegetarian, [12] Listen to Garth Brooks



COURTNEY HAYES AND WENDY EWALD



YASHICA CHIOMA JOHNSON AND WENDY EWALD

### Chris, Fifth Grade

*White writing as black self*

My name is Jonathan Tarp. I live in Washington, D.C. I want to be the first black President. I think I can because I'm nice, fair and have good judgement, and if I can't be President, I'll be a cartoonist. My favorite food is pizza. My favorite color is blue. I'm a nice person. I love pets. I have two albino mice, Pinky and Brian, a calico kitten, Coco, and two dogs. Their names are Sparky and Shadow. I can draw good. I have blue-green eyes, brown hair. I'm about five foot....I want to go to Harvard.

### Rachael, Fifth Grade

*African American writing as white self*

My name is Nicole Kimberly Walters. I am sixteen. My hobbies are listening to rock music and roller-skating. I have long nails. I like Michael Jackson. I don't like rap. I like reading Nancy Drew. When I grow up, I'll work at an Italian Pizza

Ria. People call me names like Snow White. I have rich parents named Michael and Debbie Walters. My sister is Amy, and my brothers are Matthew and Adam. Black people are nice. I have many black friends too. I like going to the mall with my friends....I am spoiled. I have long hair.

### Zavier, Fifth Grade

*African American writing as white self*

If I was white, [1] I will change my name to Jonathan on *Family Matters*. [2] People will call me a saltine. [3] I will be a rock star on stage. [4] I will stay in school. [5] Going to funerals will be different. [6] I will like to go to Greek restaurants.

### Danielle, Fifth Grade

*White writing as black self*

My name is Denise Freeman. I'm eleven years old and have seven family members. I'm five feet and weigh seventy-seven pounds. I have two sisters and two brothers. My family is nice, I'm Baptist. I

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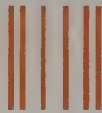
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Wendy Ewald is the author of *I Dreamed I Had a Girl in My Pocket: The Story of an Indian Village* (W.W. Norton, 1996) and *Magic Eyes: Scenes from an Andean Childhood* (Bay Press, 1992). A major retrospective of her work will open at the Addison Gallery of American Art in Andover, Massachusetts in January, 2000.

Wendy is a contributing photographer at *DoubleTake*, which we reviewed in No. 92 (1317 W. Pettigrew Street, Durham, NC 27705, [www.double-takemagazine.org](http://www.double-takemagazine.org)). This introduction originally appeared there in slightly different form.

GREGORY BLAKE AND WENDY EWALD

MYRICALE JACOBS AND WENDY EWALD

have green eyes and short black hair. I live in Brent Creek. I like loud music and wear baggy clothes. I like to dance and sing songs on the radio. I hate when people talk behind my back. I also hate when people talk back.

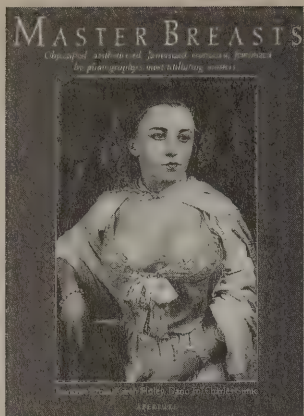
### Kenneth, Eighth Grade

*African American writing as white self*

If I was white, I would look like that man on *White Men Can't Jump*. I would play basketball a lot. I would go to ballroom dances. I would be normal in my personal activities. And always I would jump. I would be normal as a different race. If I were white, I would be rich so no one would know about it. If I was white I would buy anything I wanted.

The children's essays appear in *White Lies: Race and the Myths of Whiteness*, by Maurice Berger (Farrar, Straus, Giroux, 1999).





## MASTER BREASTS

Francine Prose, et al. 1998; 112 pp. \$39.95. Aperture Foundation, 20 East 23rd Street, New York, NY 10010, 800/929-2323, 212/598-4205, fax 212/598-4015.

Call us the spawn of Hugh Hefner. Has any "Boomer" male

ever met a D-cup he didn't admire? In the 1960s it was *Playboy* that raised breast consciousness to the level of idolatry. *Master Breasts*, a gorgeous coffee table book of photographs, is a thinking-person's guide to breast mania. It combines photos and graphics with provocative essays from novelist Francine Prose, performance artist Karen Finley, playwright Dario Fo, poet Charles Simic, and others. Intelligent and surreal, this art book is not for the faint of heart.

—Patrizia Dilucchio

PHOTOS ON BOTH PAGES FROM *MASTER BREASTS*.



"I'd imagined—stupidly, as it turned out—that breasts were a way of measuring yourself against other girls, of seeing where you stood in the procession—rushing or trudging, dragged, kicking and screaming—the Long March toward female adulthood. A. had breasts. B. and C. didn't. D's were already large. It was public knowledge, and clinical: competition without rancor. I didn't envy D. her breasts. I didn't have the time; I was too busy fearing (hoping, perhaps) that I would never have them. Besides, we girls were still not completely differentiated, so D.'s breasts were almost like *group* breasts as we clung together in squirming lumps, squealing like litters of piglets. But that was part of the message that breasts were about to bring: breasts were yet more physical evidence that we were separate, on our own, or in the process of turning into our singular lonely selves.

"My life changed drastically in 1991 when I was diagnosed with breast cancer, and had a mastectomy....The reaction of society to me as an 'asymmetrical woman'...provided more grist for the mill.



## NERVE Literate Smut

Genevieve Field and Rufus Griscom. 1998; 272 pp. \$15. Broadway Books/Bantam Doubleday Dell Publishing.

Once upon a time, you had to be rich to start the hottest little lit magazine on the pop culture scene. George Plimpton did it with the *Paris Review*. A generation later, *Granta* came along.

Today's sizzler is on the web at

[www.nerve.com](http://www.nerve.com); it's *Nerve*—and it's edgy and unflinching. *Nerve*, the book, is the first print collection of some of the best essays, stories, and images to appear on the webzine. It introduces us to work by such edge culture icons as William Vollmann, Poppy Brite, Thom

Jones, and Rick Moody; to futurist John Perry Barlow and others; and to controversial political mavericks like straight-shooting Joycelyn Elders. Edited by *Nerve* founders Field and Griscom—mean writers in their own right—this collection is literate and sexually charged: it takes nerve to read *Nerve*. Do it. —PD

"Now when I was a kid, and I've never known a kid who wasn't riveted by pornography, I wanted more and more of it. I never saw enough of it to satisfy myself. That's because there's tremendous knowledge there, tremendous knowledge about human behavior.

You also get a sense of sexual behavior of a panorama of people that you couldn't possibly have in your life unless

you devoted your life to sex. One of the ironies about sex is that it enables people to free themselves from chasing after sex. A lot of that knowledge can now be obtained in a secondary fashion, through pornography.

"Shame, like orgasm, can be fleeting. It sends its message as swiftly as a hornet underfoot, stinging me for sharpening my tongue on someone softer than myself or letting down a good friend in some small but significant way. But I am forgiven or I forgive myself and move on, hopefully noting the incident for future reference. I can count on one hand the things I'm ashamed of at this very moment, and my sexuality is not one of them...at this very moment.

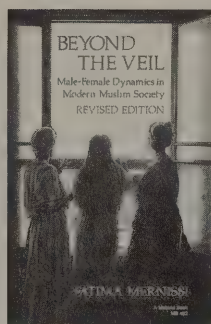
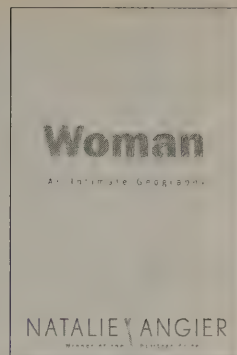


## WOMAN: AN INTIMATE GEOGRAPHY

Natalie Angier. 1999; 416 pp. \$25. Houghton Mifflin.

Pullitzer Prize-winning science writer Natalie Angier of the *New York Times* has written a book so good that from the first page you sense it will become a classic. This is not cold science, or a rehashing of what you learned in the tenth grade; Angier navigates through womanhood from conception forward, defining who and what we are. From the egg that begins our journey to the chromosomes that determine our gender, from the reverence for breast milk to the history of hormones, this a road map for our brains and our souls.

— PD



## BEYOND THE VEIL Male-Female Dynamics in Modern Muslim Society

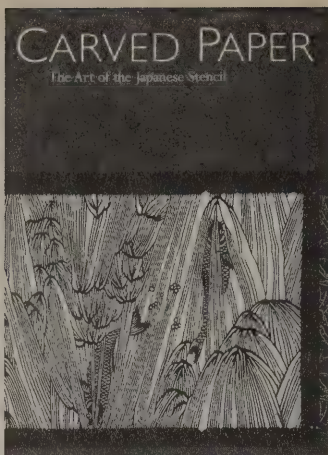
Fatima Mernissi. 1975, 1986; 200 pp. \$12.95. Indiana University Press, 601 N. Morton Street, Bloomington, IN 47404, 812/855-4203, fax 812/855-7931, iuporder@indiana.edu, www.indiana.edu/iupress.

If ever a group was shrouded in mystery and misperception, it's Muslim women; and the veil—whether a full-body *burqa* in Iran or a simple head scarf in Turkey—has a lot to do with it. Long the focus of Western curiosity and indignation, the veil is a symbol of both women's freedom and their oppression within Islamic society. In *Beyond the Veil*, Fatima Mernissi, a Moroccan academic and member of a feminist collective in Casablanca, asks: Does gender equality have a basis in Islamic law, and what is its status in Morocco? To show modernization's effects on male-female dynamics, she interviews secluded housewives and cosmopolitan bureaucrats, and includes a series of engrossing letters written to the religiously trained host of a radio counseling program. In the twenty-five years since the first edition of this book, more and more women have gone to work and shed the veil—even as religious conservatism has increased. What hasn't changed, says Mernissi, is the centrality of faith to feminists and traditionalists alike. —Lyssa Mudd

“One of the first things I noticed as I began shopping during pregnancy for baby ballast is that three decades after the birth of the current feminist movement, there is still no escaping the binary coding by color...Maybe it's because the promiscuous use of sonograms and prenatal tests means that most people know the sex of their baby ahead of time, so there's little need to hedge your purchase even when buying a gift for a prenat. Whatever the reason, the emphasis on sartorial sex distinctions seems stronger than ever before.

“Relations between the sexes seem to be going through a period of anomie, of deep confusion and absence of norms. The traditional norms governing relations between the sexes are violated every day by a growing majority of people without their incurring legal or social sanctions. One such tradition is sexual segregation, the systematic prevention of interaction between men and women not related to each other by either marriage or blood. Sexual segregation divides all social space into male and female spaces....The veil is an expression of the invisibility of women on the street, a male space *par excellence*.

“Sir—I was in love with a young man. He asked me to let him kiss and caress me. I gave in to his demands....After a while I discovered that he was not serious about our relation and I kept away from him. And I promised myself that I would never commit such sinful practices again. Is what I have done permissible or forbidden by Islam? What can I do to erase such sin?”



### CARVED PAPER The Art of the Japanese Stencil

Susanna Campbell Kuo, et al. 1998; 233 pp. \$60. Weatherhill.

This is an immensely rich and comprehensive book, the first of its kind, about Japanese paper-

Top right: In thrust-carving, the knife tip punctures paper placed over a "hole-board."

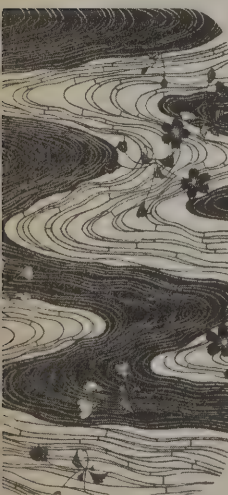
stencil carving (*katagami*) used in textile resist-dyeing processes. It's filled with extraordinary reproductions of printed textiles and of the actual stencils, which are made from mulberry paper and persimmon tannin and carved by craftspeople into intricate repeat patterns, using a variety of methods that are illustrated in this carefully researched book.

*Carved Paper* describes the historical and societal importance of the printed textile industry, which involved an extensive distribution system throughout Japan. The textiles were very popular for uses ranging from the formal dress of Samurai to hemp and cotton work clothing.

The book focuses mainly on stencils from the Santa Barbara Museum of Art collection, with pieces made from 1850 to 1930. It points to the designs' affinity with ideals of the Arts and Crafts Movement and of Art Nouveau.

—Arthur Okamura

Below: "Cherry blossoms on dark and light streams." Stencil and thrust-carving with silk webbing.



“It was probably sometime between the tenth and the twelfth centuries that paper was first treated with persimmon tannin to give it strength and water resistance, a step necessary for the production of paper stencils for dyeing. The earliest examples of stencil dyeing appear on leather armor from the Tengen era (938–947). Many more examples of stencil-patterned armor have survived from the end of the Heian period (794–1185), when the rivalry between two powerful warrior clans, the Taira and the Minamoto, had thrown the country into turmoil....Designed for mounted archers, early armor was made of plates of lacquered leather and iron laced together with cords so that it was comparatively light and flexible. Most of the leather surfaces were covered with stenciled designs. Even the hide lacings that held the lacquered plates together were patterned with small cherry blossoms or stylized rows of iris (*shōbugawa*), two motifs associated with the samurai. The falling cherry blossoms symbolize the warrior's short life. The martial iris motif (a crosslike flower

flanked by two or three short lines) represents the warrior spirit because the word for iris, *shōbu*, means “valor” as well.

“Usually, eight sheets of lightweight paper are cut at one time. Weights are placed on the stack of stencil paper, which is not turned or moved until carving is completed. When a stencil is well cut, all the tiny disks of paper will fall out of the holes. Cleanly cut holes are called “white eyes” (*shirome*). Holes that are blocked by incomplete cutting are “black eyes” (*kurome*). The drifts of confetti that litter the carver's worktable are called “eye dirt” (*mekuso*). The natural impulse to shake the cuttings out of the stencil during the carving process must be suppressed because it will be impossible to cut accurately if they become wedged between the sheets of paper.

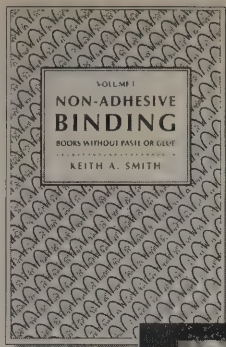


Above: “Carp ascending a waterfall.” Stencil and thrust-carving with silk webbing.



Right: Woman Walking beside Sumida River, Utagawa Kunisada (mid-1840s; panel from a triptych). Color woodblock print.

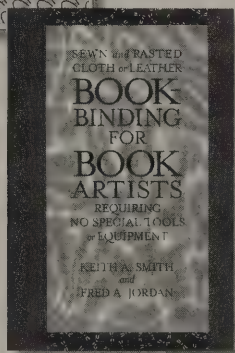




## NON-ADHESIVE BINDING VOLUME I

Books Without Paste or Glue

Keith A. Smith. Third edition, 1997; 315 pp. \$30 (bound or unbound), \$50 (set of both). Shipping: UPS Ground—1 book, add \$4; 2 books, add \$4.50; 3–6 books, add \$5. Keith Smith Books, 22 Cayuga Street, Rochester, NY 14620-2153, phone/fax 716/473-6776, ksbooks@netacc.net, net2.netacc.net/~ksbooks.



## SEWN AND PASTED CLOTH OR LEATHER BOOK-BINDING FOR BOOK ARTISTS REQUIRING NO SPECIAL TOOLS OR EQUIPMENT

Keith A. Smith and Fred A. Jordan. 1998; 424 pp. \$35 (bound or unbound); \$60 (set of both). Keith Smith Books.

The book arts are burgeoning! If you're bored with flimsy paperbacks and dusty old

leather-bound tomes, and itch to make books with intricate concertina constructions and Japanese stab bindings, *Non-Adhesive Binding* and *Book Binding for Book Artists* are the perfect how-tos. Keith Smith and Fred Jordan take bookmaking out of the bindery and into your kitchen by substituting household tools for special equipment. They list sources for paper, materials, classes, and dealers of artists' books, and teach binding

techniques with clear, detailed instructions and ample illustrations.

*Non-Adhesive Binding* shows how to make books by folding and sewing paper rather than gluing it. Its thirty-two binding techniques range from simple pamphlets to the piano-hinged collapsible star. (If you're hungry for more, the second and third volumes in the *Non-Adhesive Binding* series are encyclopedias of specialized projects; see access below.) *Book Binding for Book Artists* adds glue and paste to the equation and shows how to make elegant, hardbound books with leather and cloth covers.

Best of all, the books come as paperbacks or unbound (so you can start your practice from the get-go). If you do buy the unbound version, Smith recommends sewing the sections together with a Coptic stitch (described in *Non-Adhesive Binding*), which allows the book to lie flat when open...leaving you with both hands free to bind books.

—Lyssa Mudd

“Day one:

The first bindings are the most difficult. The beginner has a far greater challenge than the expert. The more simple the binding the greater the challenge.

Fold a sheet of paper in half. The surface for display of text or picture has now been removed from the two-dimensional world of the single-sheet format. The resulting folio is now two connected planes, movable, able to arc in space because of the created hinge. The hinge-fold also delineates four surfaces as four pages.

The concept for using paper for text or pictures has been totally altered by the simple act of folding a piece of paper and understanding the consequences. Learning to see requires vigilance so that actions are not taken for granted.

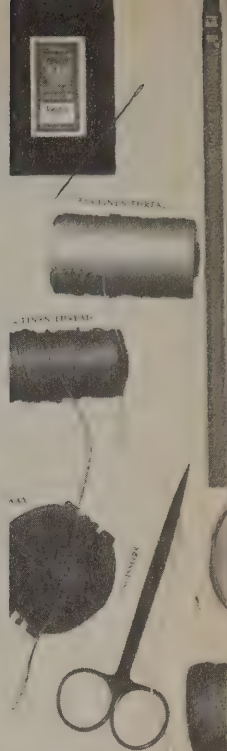
—NON-ADHESIVE BINDING

“Fred and I cook our paste. If we

are going to paste that day, we can take out the pastry flour, measure, cook and within 3 minutes we are pasting paper. The paste will be warm, but it will stick. You do not have to wait until the paste is cold to use it.

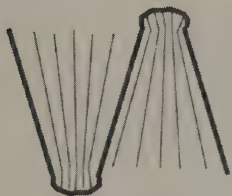
...I keep a towel on my shoulder as I am pasting. I can quickly dry my hands to handle the decorative paper or answer the phone.

—BOOK-BINDING  
FOR BOOK ARTISTS

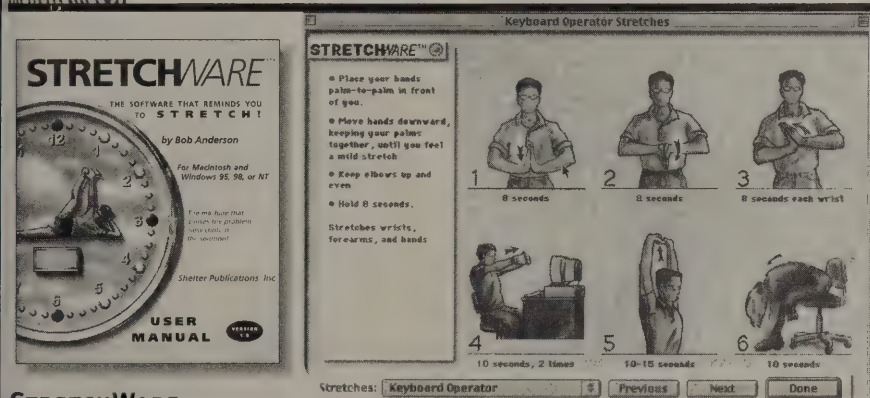


Above:  
The simplest of tools can get you book binding. From *Sewn and Pasted*.

Below:  
“Back-to-back.” one of many compound-binding styles. From *Non-Adhesive Binding Volume I*.



Dos-à-Dos



## STRETCHWARE

Bob Anderson. 1998; for Macintosh and Windows 95, 98, or NT, \$39.95 (\$43.90 post-paid). Shelter Publications, Inc., PO Box 279, Bolinas, CA 94924, 800/307-0131, 415/868-0280, fax 415/868-9053, shelter@shelterpub.com, www.shelterpub.com.

If I don't develop good habits of regular stretching while in front of the computer, Bob Anderson and the people at Shelter Publications won't be to blame. In 1997, they followed their excellent 1980 book, *Stretching*, with *Stretching at Your Computer or Desk* (Whole Earth No. 90). They published laminated charts for those too lazy or distracted to consult the book. Now they've made the computer its own antidote.

Pick a routine from the pull-down menu, or ask to be reminded at whatever time intervals (or number of keystrokes or mouseclicks) you wish. Choose a preferred reminder: sound (I particularly like the bell, but the harp's not bad) or flashing icon or dialog box. The dialog box politely asks, “Do you have time to stretch?” You can answer yes or no, or ask it to nag you again in five, ten, or fifteen minutes. When you say yes, one of fourteen different one-to-two-minute stretching routines appears. Place the cursor on the illustration to call up instructions for that stretch. That's it. Whoops. There's the bell. Got to stop typing and stretch. —MKS

# The White Dog Cafe

Judy Wicks and Kevin von Klause at the Bioneers Conference



**Judy Wicks:** The White Dog Cafe is the first floor of my house in Philadelphia. Living above the shop, in the old-fashioned way, helps me see life in a more holistic way. Back when most people lived above the shop—whether a tailor shop, bakery, family restaurant, or family farm—there was an integration of family and work. Kids learned economics doing the family business. Then suddenly it was off to the factory and off to the school, making everything separate.

We strive at the White Dog to develop a sense of interconnectedness among people who are different from each other. One way is through our international program, "Table for Six Billion, Please," which started twelve years ago around the image of walking into a restaurant and asking for a place at the table for everyone in the world.

We have sister relationships with restaurants in different countries where the United States has misunderstandings. We take groups of customers to countries such as Cuba, Vietnam, and the former Soviet Union, and we see the country through the eyes of food. We visit farms, markets, and restaurants to feel how US foreign policy affects the lives of people.

We also have a local sister restaurant project with minority-owned restaurants in ghettoized areas of our city. For instance, we have a Puerto Rican sister restaurant in the barrio. Our White Dog customers, mostly from the suburbs or center city, don't usually go into an all-black or all-Puerto Rican neighborhood. We advertise sister restaurants in our newsletter, which we distribute to 18,000 customers. For example, our African-American sister restaurant in North Philadelphia is advertised along with the new women's basketball team or a play at a theater up in North Philadelphia.

We do an eco-tour each year. The last one we did was on water—where



our water comes from and where and how it's purified. We did others on energy, affordable housing, and community wellness. We did a community garden and a prison tour.

We had a program at Graterford Correctional Institution with inmates who had started an organic gardening project. We took vegetables from the garden and Kevin made a vegetarian dinner. A group of our customers had dinner with the inmates. It was quite a moving experience. After dinner, the inmates talked about how gardening had transformed them. We now have a right-wing governor in Pennsylvania who disbanded the program because he believes prisoners are there to be punished, not to be rehabilitated.

On Monday nights we do "table-tops" with speakers on issues of public concern. In fact, some people kid us that we use good food to lure innocent customers into social activism.

On Tuesday nights we sponsor storytelling. These are real stories by real people. We have a series called "Tales from Jails" where ex-offenders tell their stories. If immigration is in the news, we invite recent immigrants to tell their stories. If same-sex marriage is being debated in the news, we have a gay and a lesbian couple. It's a way of understanding together and getting a sense of inter-

connectedness in the city.

We have lots of events to celebrate diversity. In the summertime we have a *Noche Latina* in the streets, with a Latin band and a big Latin-American buffet. We also do "Rum and Reggae." It's all about eating, drinking, and dancing, celebrating in the streets. Fourth of July everybody dresses up. I dress as a pregnant colonial woman and give birth out in the street. I have a sign on my back that says, "George Washington slept here." This big beach ball is on my stomach and I'm in a clown face with a colonial dress. Under the covers I push the ball back through this hole in the bed to deliver my twins, Liberty and Justice, who hop on the stage—a black girl and a white girl—and do a tap dance to "Yankee Doodle Dandy." Then we roll out the Statue of Liberty and sing "God Bless America." It's quite a community pageant.

We have a mentoring program for inner-city high-school students interested in getting into the restaurant business. They come in and shadow our staff for most of the day.


Recently, we've been focusing on one of our sister restaurants in Chiapas, Mexico. I've gone to Chiapas four times. After the Actiel massacre, I formed a group called Businesses for Human Rights and Fair Trade in Chiapas. We work with businesses that import coffee or crafts from southern Mexico. We sent a delegation of eighteen businesses to investigate how the violence affects the lives and businesses of our trading partners. Then we held a well-attended press conference in Mexico City. Mexicans aren't used to hearing US business on the side of the Indians. So they were very shocked that US companies were concerned. It actually made the headlines: "US Firms Call for Peace in Chiapas."

We just sent another delegation down. We're trying to expand our

business relationship with the Zapatistas. They have claimed certain areas as autonomous zones; the Mexican government is not recognizing these zones and has been attacking them. We're going to start a coffee company and a honey company in one of the autonomous zones, and have started a trade committee with the Social Venture Network. Through that committee and the business group, we're starting companies to promote ties and use business to achieve human rights.

We hope we're not going to be targeted in this. But if the businesses are targeted by the paramilitary or the Mexican government, then, under NAFTA laws, the businesses should be protected because of the US investment. If they're not, we feel it will be a violation of NAFTA. We'd like to see whether the NAFTA laws will actually protect small people-to-people businesses as they do multinational corporations.

We currently get our decaf coffee from a workers' cooperative in Chiapas and our regular coffee from our sister restaurant in Nicaragua. These people-to-people relationships are incredibly important to developing an alternative to the multinational economy. That's what we're really fighting for: the right to create business relationships that are respectful to both parties and build up the local economies at home and abroad.

 **Kevin von Klaus:** We also run a business serving lunch and dinner seven days a week, just about 365 days a year, plus another kitchen upstairs that serves light meals and snacks.

We have about a \$4.5 million business, so there's a lot of food to be bought. For years we have been trying to obtain ingredients from small businesses run by people whom we know and who believe in the same things that we do. Most of the products we buy, especially our produce, come from small businesses and farmers. We recently started getting very, very heavily into humanely

raised livestock. It's something we've been trying to develop for years, but it's been very spotty because of the costs of raising the animals, the space they need, and the lack of demand. Nobody wants to pay the premium cost for lamb or veal or beef.

We try to stay as local as possible, but we now import meat from Niman Ranch near San Francisco. Once a week I go to the airport and pick up beef, and especially pork, because of the terrible conditions of factory-farming pork production and its environmental impact. Bill Niman found a source in Iowa for wonderfully cared-for animals that are raised in a humane and clean environment that doesn't pollute like the surrounding places.

We're constantly working toward finding new producers, encouraging farmers to expand what they're doing, and encouraging other restaurants in the city to form a cooperative to buy from people who are using healthy feeds, who aren't giving the animals antibiotics or hormones or things like that. We want to keep our customers healthy too, and appreciate working closely with farmers who can raise produce that we know we can sell, and not be too exotic in their attempts to experiment.

Most people don't know where their food comes from; we're trying to educate our customers and staff about where their food comes from. We take customers to the farms, especially to the farm of Mark and Kitty Dornstreich, who grow beautiful heirloom tomatoes, baby lettuces, greens, cherries; you name it, they've got it out there. It's a beautiful, beautiful place. And we take them to Douglass Newbold, who makes goat cheese from a prize herd of Nubian



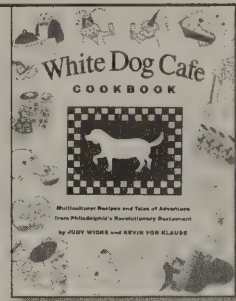
goats. They get to see where cheese comes from.

We had a dinner in October to celebrate local farmers and brewers. We had a beer-and-farm-tasting dinner where customers could meet the people who are supplying their food. But it was also a wonderful opportunity for the farmers to meet the customers. They're always curious as to how someone's going to like their harvests. To see the looks of satisfaction on both the diners' and the producers' faces is a wonderful thing. ☺



Judy Wicks founded the White Dog Cafe in 1983. Kevin von Klaus has been executive chef since 1985. See their website at [www.whitedog.com](http://www.whitedog.com). We are grateful to the Bioneers ([www.bioneers.org](http://www.bioneers.org)) for letting us reprint this talk from the 1998 Bioneers Conference.

**WHITE DOG CAFE COOKBOOK**  
Multicultural Recipes and Tales of Adventure from Philadelphia's Revolutionary Restaurant



Judy Wicks and Kevin von Klaus. 1998; 335 pp. \$16.95. Running Press.

The *Cookbook*, packed with recipes and stories from the projects that the authors describe in their talk, is a comprehensive look at the common bond of nourishment and how creative individuals can stretch in unexpected directions. I've eaten in their comfortable restaurant, which is decorated in a whimsical manner with lots of dog images. Their food reflects the cultural diversity of their programs and travels while focusing on fresh, seasonal ingredients.

I like to test recipes in a menu. Here's how my White Dog Cafe menu worked out: marinated goat cheese with fresh tomatoes; warm mushroom-spinach salad; chicken braised with tomatoes, black olives, and pepperoni, served over linguine; and harvest fruit crisp. Each recipe I tried was flavorful and fun to prepare. The *Cookbook* includes many wonderful culinary hints. This is a book with a very big heart. —Daphne Derven

Judy Wicks and Kevin von Klaus.



### THE ESSENTIAL SAFFRON COMPANION

John Humphries. 1998; 160 pp. \$15.95. Ten Speed Press.

Even if you are not certain what saffron does to food, this combination cookbook and saffron tour guide is irresistible. Saffron, the stigma of the crocus (*Crocus sativus linnaeus*), dates to Sumerian tribes, and its use as a coloring agent, medicine, and food additive is thought to go back thousands of years. Under the spell of saffron's color, aroma, and flavor, John Humphries recounts the complex history of the "feel good spice" as he journeys the world, looking for the very best filaments and dishes. His findings and whole-earth recipes—ranging from Iranian to Swedish—should make you want to make saffron a pantry staple, definitely grow the saffron crocus, and perhaps paint your kitchen a shade of that wonderful color.

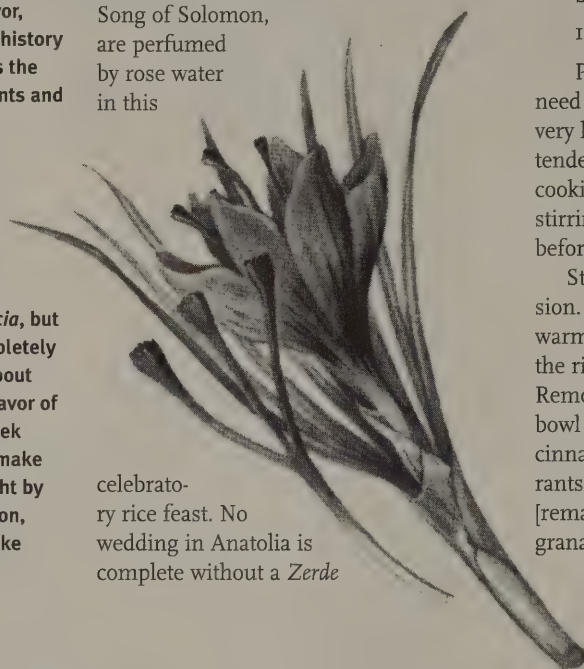
Of course, he includes *Paella Valencia*, but I recommend ignoring that recipe completely (other than expressing wonderment about the presence of the canned beans) in favor of *Arroz a la Marinera*. The mussel and leek soup was also delicious, both easy to make and quite fragrant. Most of us walk right by the pomegranates, as well as the saffron, when we shop. Next time, stop and make *Zerde*, "A Mound of Gold Studded with

Rubies"; a beautiful, colorful wedding dish of rice, rose water, pomegranate seeds, saffron, and currants from Anatolia, deserving of its name. Pennsylvania Dutch saffron bread will change your life and your toast. Speaking of toasts, the final chapter ends with saffron vodka which (so far) I have found stimulating in concept only. — Daphne Derve

### “Zerde

Turkish Rice Flavored with Saffron and Pomegranate

"Pomegranate, saffron, cinnamon, the ingredients of love," from the groom's speech in the Song of Solomon, are perfumed by rose water in this



celebratory rice feast. No wedding in Anatolia is complete without a *Zerde*

to this day. It is a truly romantic dish and is often served from a dome-shaped pilaf.

Serves 4

1/3 cup rice

1 cup water

3/4 cup superfine sugar

40 saffron filaments, or 2/3 packet

powdered saffron, infused overnight

in 1 tablespoon rose water

1 teaspoon cornstarch

2 teaspoons warm water

1/4 cup pinenuts, toasted

1 teaspoon ground cinnamon

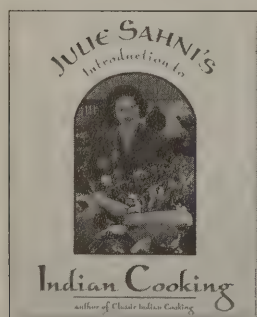
Seeds of 1/2 pomegranate

1/4 cup currants

Pick over and wash the rice if you need to. Cook the rice in the water over very low heat for 25 to 30 minutes, until tender. During the last 10 minutes of cooking add the sugar in 3 stages while stirring, allowing each addition to dissolve before adding the next.

Stir in the saffron-rose water infusion. Blend in the cornstarch with the warm water, then add, a little at a time, to the rice and stir. Cook for 5 minutes. Remove the rice from heat and place in a bowl to cool. Mix in half the pinenuts, the cinnamon, pomegranate seeds, and currants. When cool, garnish with the [remaining] pinenuts, cinnamon, pomegranate seeds, and currants and serve.

*Crocus sativus*.  
FROM THE OXFORD BOOK OF FOOD PLANTS



### JULIE SAHNI'S INTRODUCTION TO INDIAN COOKING

Julie Sahni. 1998; 230 pp. \$16.95. Ten Speed Press.

Julie Sahni, acclaimed cook, teacher, and author (*Classic Indian Cooking*), wrote this book specifically for the novice, "to dispel the notion that Indian cooking is exotic, complex, and time-consuming." Nevertheless, the dishes will reward you with complex, layered flavors accompanied by haunting and memorable aromas. Even while assembling

the ingredients and seasonings I was struck by the rich colors and textures. She begins with a short survey of the amalgamation of regional cuisines—each the distinctive product of geography, history, cultural heritage, and religious beliefs—that constitute "Indian" cooking. She provides a series of menus, the necessary staples for the Indian pantry, a glossary, mail-order sources, and a measurement equivalency chart. Clearly, she is determined not only that you will have everything you need to prepare Indian food, but that you will enjoy it. You will.

Begin with *Matha*, a beverage made with yogurt, mint, and

cumin. For me, it was like drinking the word "exotic." *Bhona Badaam* (hot and spicy almonds) and *Matha* could keep you quite happy. However, try getting totally swept away and make a meal of the following: *Mirch Raita*, a smoky roasted-pepper and mint yogurt salad which is served as a condiment; *Dal*, a flavorful dish of lentils; *Hari Poori*, a fried bread made with peas, which is a wonderful green color; *Bhona Gosht*, grilled lamb marinated in herbs and spices served garnished with grapes; and *Jeer Aloo*, potatoes with cumin. *Kheer*, Indian rice pudding with cardamom, is a voluptuous dessert with splendid textures and colors. If you've gotten this far, follow Julie's instructions and eat in the traditional manner with your fingers. —DD

“It may come as a surprise that only a handful of spices are native to India, black pepper, cardamom, tumeric, and kari leaf among them. Most of the spices in curry powder, the famous spice blend from India, are of Mediterranean origin. Cumin, coriander, fennel, mustard, and fenugreek are all native to the Mediterranean Basin. And chiles, too, are an import, introduced by the Portuguese in the early sixteenth century from the New World.

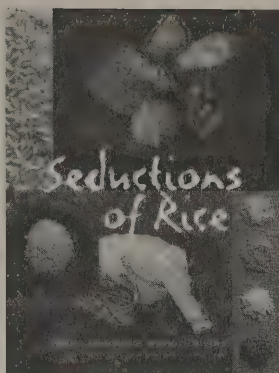
## SEDUCTIONS OF RICE

### A Cookbook

Jeffrey Alford and Naomi Duguid. 1998; 454 pp. \$35 (\$38 post-paid). Artisan, 708 Broadway, New York, NY 10003, 212/254-5900, www.workmanweb.com.

I have a frightening number of cookbooks and sometimes wonder what I would pick if I could only have a few. This is definitely one I would pick. As a guide to the history of humans and rice and a beautifully illustrated world tour of rice cultivation, preparation, and commerce, it would be a fine book. Add rice recipes, dictionary, glossary, mail-order sources, and bibliography, and you have the book to provoke or satisfy rice passion.

The dishes are full of love and flavor. Of course, many recipes are included for different varieties of rice, but other recipes are designed to be served with rice, or as an accompaniment. It is clear that all of these recipes had been tested and prepared again and again. Of the ones I tried, the cucumber-sesame salad was easy and refreshing. Shrimp gumbo and plain long-grain rice make you feel like you are in Louisiana. It would be fun to do a potluck dessert party with all the different versions of dessert rice and rice puddings from around the world. I tried the appropriately named Memories of Childhood rice pudding and it was just as I remembered. —DD



“Japanese rice is of the japonica type. It is a medium-grain rice and the raw grains are slightly glassy, translucent rather than opaque, with a light powder on them.

Rice grown in Japan is not exported. In this book, “Japanese rice” refers to Japan-style rice.

In the United States, there is a well-established Japanese-style rice production, particularly in California. Our favorite brand is Kokuho Rose, grown in California by Nomura Brothers. Other good California brands are CalRose, Nishiki, and Matsu, available at Asian groceries and speciality stores. Japanese-style rice is also grown in Korea. When properly cooked, plain Japanese rice is very slightly sticky but with distinct firm grains....

Japanese rice is sold white (polished) or semi-milled or brown. There is also a distinctive and special kind of Japanese rice, a sticky rice; see mochi gome and sticky rice.

### “Basmati Rice

Lots-of-water method  
Makes about 6 cups of rice

In many Indian households from Bengal to Trivandrum, plain rice is

cooked as we cook pasta, by boiling it in plenty of water. The water is usually not salted. Basmati rice expands greatly during cooking, so two cups raw rice yields about six cups cooked. It is very important that you watch the rice carefully to prevent overcooking; as with pasta, the best way is to test the rice every thirty seconds or so for doneness, beginning at the three-minute mark after it returns to the boil. It should be cooked through, with no solid core, but still firm, not mushy.

2 cups basmati rice  
12 cups water

Approximately 2 tablespoons melted ghee or butter

Wash the rice thoroughly until the water runs clear. Place in a bowl and add cold water to cover by at least 2 inches. Let soak for 30 minutes, then drain.

In a large pot, bring the water to a

### “Kachoomar

The relish *Kachoomar* is used primarily to add moisture to a meal. Not surprisingly it goes well with stuffed breads, tandoori meats, roasts, and grilled chicken, lamb, and beef. Unlike Mexican salsa, which can range in heat from mild to dynamite-hot, Indian salsa is mild and fragrant. Particularly nice additions to the basic mix of tomatoes, chiles, cucumbers, and onions are daikon radish and Kirby cucumbers.

Serves 4

1 cup finely diced tomato, drained

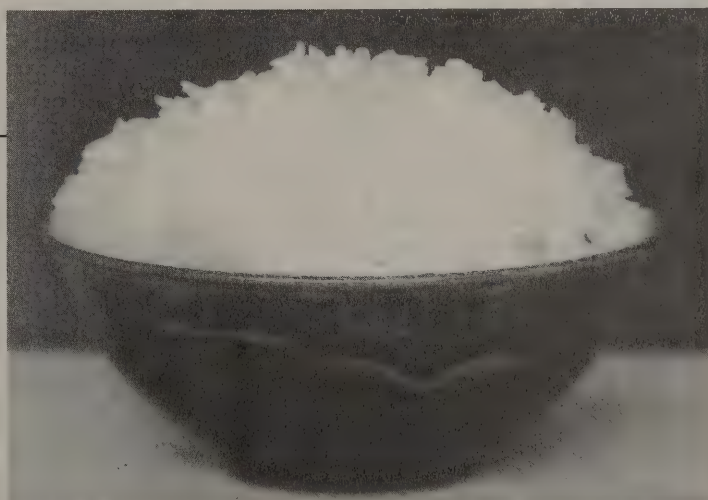
1 tablespoon chopped green chiles

1 cup finely diced cucumbers, preferably Kirby

1 cup finely diced radish, preferably daikon

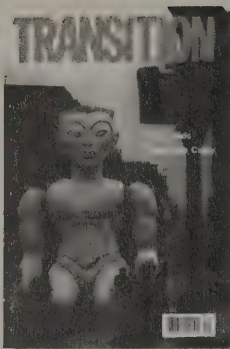
1/2 cup chopped fresh coriander (cilantro) leaves and tender stems

Put all the ingredients in a bowl, toss well to mix, and serve. (The salsa can be prepared ahead and refrigerated for up to 1 day. Bring to room temperature before serving.)



Freshly cooked Thai Jasmine Rice.

vigorous rolling boil. Add the rice, bring back to the boil, and cook for 3 to 5 minutes uncovered, until the rice is just tender but not mushy. Drain thoroughly in a sieve. Place back in the pot, set over very low heat, drizzle on some melted ghee or butter, and cover tightly. Let steam-cook for 20 minutes. Serve mounded on a platter, either plain or with a little more melted ghee or butter drizzled over.



**TRANSITION**  
An International Review

Edited by Kwame Anthony Appiah and Henry Louis Gates, Jr. \$24/year (quarterly). Duke University Press, 905 West Main Street, Ste. 18B, Durham, NC 27701, 888/387-5687, 919/687-3602, fax 919/688-2615, dukepress@duke.edu, www.duke.edu/web/dupress.

*Transition* is the sort of journal you keep because a collection of this hefty, eclectic quarterly chronicles the best thinking on race. Founded in 1961 in Uganda as a forum for African intellectuals, the magazine saw two of its editors jailed during its fifteen years of publication. In 1993, the W.E.B. Du Bois Institute at Harvard revived *Transition* under the editorship of Henry Louis Gates, Jr. and Kwame Anthony Appiah. Its editorial board reads like a who's who of the world's most respected Black intellectuals. Essays on the politics of golf in the Caribbean and the apotheosis of Latina pop star Selena are rigorous and intellectual but not overly academic. *Transition* is an education on the African Diaspora, a gold mine of good writing, and a lively forum for rappers and Créole novelists, race traitors and griots, Black Panthers and Japanese teenagers in blackface. — Lyssa Mudd

“ There is perhaps no contemporary music more concerned with stereotypes than hip-hop. Against a pastiche of rhythmic loops from 1970s funk and soul records, new synthesized sounds, and snippets from radio and television, the most marketable fantasies of black and white alike come to life: proud mothers and roughnecks, black scientists and licentious

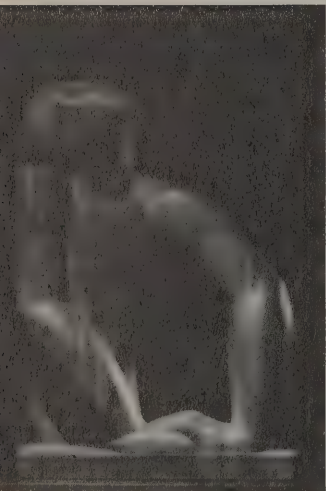
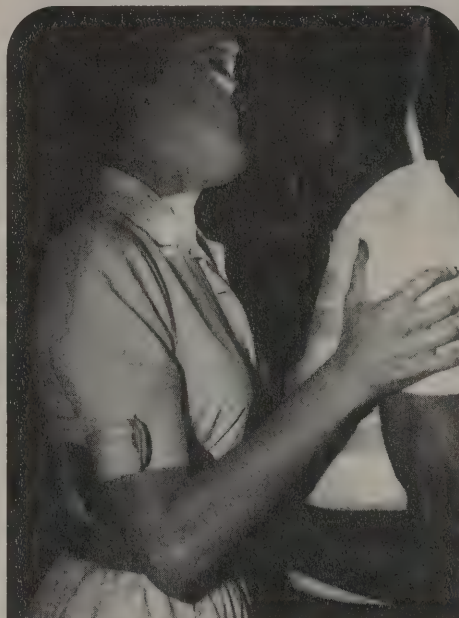
women, all laughing and shouting at one another, loving and cursing, praying and studying. But no character in this exaggerated landscape is more central—or more surprising—than the African American preacher, that figure of cultural and spiritual enlightenment whose truth derives less from sincerity than from bravado. The black preacher is the prototypical rapper, a charismatic vernacular performance artist. Rappers—priests and gangstas alike—are obliged to talk so much that they can't help but talk shit; they end up professing what they do not necessarily believe. —KELEFA SANNEH (ISSUE 74)

“ America is not so much a country as it is an idea, and that must be why so many people are drawn to it, the idea of it, the idea that you might be free of your past, free of the traditions that kept you in your own tradition—that is the idea of it: freedom from your very own self. But freedom from yourself and your own traditions is fine...for ten seconds. Past that is insanity. Everyone in every place needs a boundary; in America the

boundary is the phrase “I am not black...”

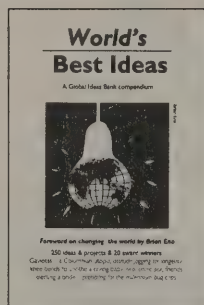
Ordinarily, the color of your skin is not a spiritual experience; ordinarily the color of your skin just offers protection from too much exposure to the sun. For the African in America, this is not so. The color of skin determines everything—where you will live, and then again, how you will live. The color of your skin is the national religion of America, and the African in our midst is its prophet and priest. —JAMAICA KINCAID (ISSUE 73)

“ Whether celebrating eroticized images of white male bodies in the context of Nazism or celebrating black bodies in complete isolation, Riefenstahl represented her willing subordination to a world of patriarchal authority. Had she chosen to critique and rebel against that authority, Leni Riefenstahl might never have created the body of work that has ensured her reputation. It is not merely the aesthetic value of this work that will determine its place in history, but its content as well. —BELL HOOKS (ISSUE 73)



**WORLD'S BEST IDEAS**  
A Global Ideas Bank Compendium

Nicholas Albery, Stephen Evans, and Stephanie Wienrich, eds. 1998; 300 pp. £17, \$27.20. Institute of Social Inventions, 20 Heber Road, London NW2 6AA, UK, +44(181) 208 2853, fax +44(181) 452 6434, rhino@dial.pipex.com, www.globalideabank.org.



Just as cheetahs have a talent for speed, humans have a talent for imagining—for wondering how else things might be. This means that, unique among animals, we can rethink our social arrangements. Although such a talent is a mixed blessing—we are as capable of manufacturing arrangements that enslave us as liberate us—we nonetheless have no choice but to use it. We can't withdraw from the imagining game, just as cheetahs can't withdraw from the running game. It's our niche, our living.

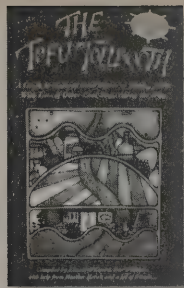
It's strange then, that our new media—the instruments charged with reporting back to us how we're doing—should be so much more fascinated by bad

ideas—or the failure of good ones—than by successes. We drown in bad news, tales of how things went wrong, but we have only the most cursory discussion on how they might go right.

Is this because we still won't—or can't—accept our own astonishing powers? Is it more comforting to see ourselves as victims of uncontrollable complexities than to take some responsibility for the way things are

and make some decisions about how else they could be better? Or are we just frightened of getting it wrong—paralyzed by the long history of Utopian ideas gone bad?

This book, and the approach to world-changing it espouses, is not Utopian. It doesn't say “we'll build a whole New World from scratch and if everyone does what they should it will all be perfect.” It offers much more pragmatic, much more incrementalist strategy. Instead of an all-embracing ideological overview from which correct behavior is supposed to flow, it takes a case-by-case approach to changing the world. It says “Given what we have and what we now know, wouldn't it be better if we did this particular thing in this other way?” Primarily, it's a work of research—scanning the world for signs of more successful and human



## THE TOFU TOLLBOOTH

Elizabeth Zipern and Dar Williams. 1998; 249 pp. \$14.95 (\$18.45 postpaid). Ceres Press, PO Box 87, Woodstock, NY 122498, 914/679-5573, fax 914/679-5573, www.tofutollbooth.com.

After a day of planes, airports, and delays, we flew into Bangor, Maine, ravenous for something besides airline eats. We were tired and hungry, had never been to Bangor, and didn't know anyone there. I confess: we—fairly committed vegetarians—ended up staggering into Burger King's salad bar. Next time, that won't happen, because we'll be packing *The Tofu Tollbooth*.

Folksinger Dar Williams wrote the first edition of *Tollbooth* after years of food frustration while on tour. The new, second edition lists more than a thousand natural food stores and eating spots, from every state except Alaska and Hawaii. It ties listings to state maps, and includes directions from the closest major highways. Each entry is keyed for sixteen features. "Hot tips" from staffs at many of the stores point to favorite places to eat or take a break from the road. Keep a copy in your backpack, suitcase, or glove compartment. —MKS

ways of doing things, and then re-presenting them in new mixes and matches. In that sense, it's *The Good News*, the stuff that doesn't make the headlines, the material of human success. —Brian Eno, from the introduction (suggested by Roger Knights)

“Postal service recognises ‘no junk mail’ signs

*Adapted extract from EcoNews (April '98).*

Under Canada Post's new arrangements, if you don't want any junk mail, you just have to say so, with a clear sign by your mail box. Nationally, 1 per cent have gone junk-free, rising as high as 11.3 per cent in Salt Spring.

“Wheat fields ploughed at night need no pesticides

*Summarised from an item by Oliver Klaffke, entitled 'Why farmers should love the dark', in New Scientist (April 11th, '98).*

Peter Juroszek and colleagues at the University of Bonn in Germany have found that strips of land ploughed at night grow five times fewer weeds.

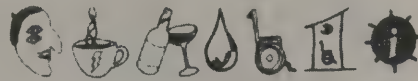
## BANGOR

On Center Street in Bangor, check out the Lemon Tree, a restaurant widely admired for its funky vegetarian dishes.

### NATURAL LIVING CENTER

570 Stillwater Avenue, 04401 • (207)990-2646

M-Sat. 9:30-7, Sun. 12-5



From I-95, take Bangor Mall exit. Store's just behind mall at cinema entrance.



### BICYCLING MEDICINE

Cycling Nutrition, Physiology, and Injury Prevention and Treatment for Riders of All Levels

Arnie Baker, M.D. 1998; 320 pp. \$14. Fireside.

How do you prevent or correct saddle sores, aching knees, and numb hands? Which medications are useful and which are merely fads? What exercises build stamina and prevent injury? What's the best fuel? Should you ride when you have a cold? The important stuff you need to know about becoming a reliable, powerful bike motor is attended here. The adviser is experienced. His fee is modest. No appointment needed; the Doctor is IN.

—J. Baldwin

“If you are thirsty, you are dehydrated. Your body responds to dehydration with a sense of thirst, so dehydration has already happened. Also, the older we get, the slower our body's thirst response becomes....

If you are riding in cool weather, one water bottle an hour is the standard recommendation. It may or may not be enough....On average, I leave at 147 pounds and come back at about 142 pounds. If I'm 5 pounds lighter at the end of a ride, it means I am still down more than 2 quarts of fluid.

“We all get a cold or the flu every once in a while. We suffer minor and major health problems. When is it OK to ride, and when should one take time off the bike?...If you are honest with yourself, you can usually figure out what you should do. Lots of cyclists call me up to ask what they should do. I usually ask them what they think. They almost always know. If you want to ride but think you maybe you shouldn't, try riding half the distance you think is reasonable. If you feel OK, complete the ride.

Anaerobic efforts are more difficult when you are ill with a respiratory infection. It's usually a good idea to severely reduce or avoid them.

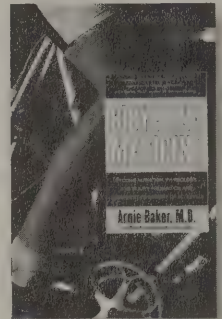
Wheat fields in particular grow so few weeds that pesticides are unnecessary.

The seeds of most weeds need less than a millisecond's light for germination to begin, whereas the seeds of most crops can grow in complete darkness. Ploughing brings seeds temporarily to the surface before they are reburied.

“Target in urinal reduces spillage

*Adapted extract (monitored for the Institute by Roger Knights) from an item in the Wall Street Journal about a Dutch firm which manages the International Arrivals Building at JFK Airport.*

Each urinal at the Amsterdam airport has the black outline of a fly etched into the porcelain—“This improves the man's aim,” says Aad Kieboom, an economist. His staff conducted fly-in-urinal trials and found that etchings reduce spillage by 80 per cent. The Dutch will transfer the technology to New York. “It gives a guy something to think about,” says Jan Jansen, the new Dutch general manager in New York. “It's a perfect example of process control.”



# Sounding Alive

Composing Music with Patterns of Nature by David Rothenberg

Music has always looked to nature for inspiration. Waves wash rhythmically against the shore. The wind through the trees sings the beginnings of the natural harmonic series of octaves, fifths, fourths, and thirds. It is an art form solidly human but at the same time reaching out beyond the human. We can sing with birds, play along with whales, find melodies even in the coursing paths of planets and stars.

But music is no universal "language." What's great about it is that we can understand music even when we don't know what it means. Its ornate sounds touch us and move us before we can explain or recount what is going on. That is, it's true magic, and one human art that might connect us further to the world around us, rather than set us apart. Because nature is playing and composing all around us, we might just learn to listen to the world as a vast, thundering, and delicate improvisation.

Beethoven and Debussy may have placed the pull of the elements inside their works, but today we have two new ways music and nature have coevolved. First, there are those works that have been shaped directly out of natural sounds, as recording technology (especially digital recording technology) has made it much easier to create art right out of the raw material of sound. Though you sometimes see CDs advertising a real-life, unedited, unexpurgated day-in-the-life-of a rainforest or a seashore, any of these works is really a musical composition, put together by a composer with definite aesthetic priorities. The best of these nature recordings are real works of music.

There's a second way nature may rise up in music. A more interesting alliance is the blending of natural



Flautist Michael Pestel and ground cuckoo (see excerpt, p. 62).

FROM *TERRA NOVA* (SEE REVIEW, P. 62)

noises with played instruments. There can be a jazz based on sound-changes rather than chord-changes, as musicians learn to improvise along with the tones inherent in our more-than-human world. Nature does not follow any fixed fate or plan, so it is natural that improvisation should be a fruitful way to work out a music along with nature's flow. A liberal understanding of jazz can contain this kind of expanded direction, though more conservative jazz pundits might relegate this kind of experimentation to the New-Age bin. If it's good, though, there is often too much excitement in the mix to produce New-Age calm.

That's one way the Earth and the player can blend. The other link is more subtle. It was John Cage who made this century's musicians aware of the Aristotelian idea that art should imitate nature "not by mimicry but in manner of operation." If the music

works like nature, it can fit into nature. These musics are harder to spot: they are endlessly creative, multifarious, complex beyond the human ability to analyze, but still must be immediately beautiful. Even if they're not made out of natural sounds per se, they must solidly sound alive.

A culture's music is often its most noble creation. Let's hope ours helps humanity to blend into the world, not be closed up in dark rooms, listening silently, so far away.

Here are some books and recordings to help you find your way out into the world in order to listen. ⊕

David Rothenberg has been the editor of *Terra Nova* (see review, p. 62), one of the finest journals on nature and culture. It has now been turned from a quarterly journal into an annual book series, at the behest of the publisher, MIT Press. David is a multi-tasking musician, producer, writer, and teacher. He easily floats between

composing online interactive web poems and playing with the great outdoors. His latest CD, *Unamuno* (Newtone/Robi Droli, [www.inrete.it/robidroli](http://www.inrete.it/robidroli)), explores the woven entanglements of sound, especially the clarinet, in varied contexts, from klezmer-like to dry forest. —PW





### THE SOUNDSCAPE

**Our Sonic Environment and the Tuning of the World**

R. Murray Schafer. 1993, 310 pp. \$14.95. Inner Traditions.

First published in 1977, this revolutionary book introduced "soundscape" as an aural equivalent of landscape, encouraging all of us to listen more closely to the content of the earth around us as a vast musical composition. *Soundscape* traces the human awareness of sound, on the part of composers and of the rest of us, from ancient times until the present; it widens the sense of what music can be, including acoustic design as well as activism to protect the fragile soundscapes of our increasingly noisy

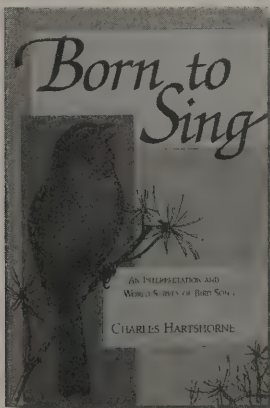
Earth. The single most essential volume in this field. — David Rothenberg

“The blurring of the edges between music and environmental sounds may eventually prove to be the most striking feature of all twentieth-century music. In any case, these developments have inescapable consequences for music education. A musician used to be one who listened with seismographic delicacy in the music room, but who put on ear flaps when he left. If there is a noise pollution problem in the world today it is certainly partly and maybe largely owing to the fact that music educators have failed to give the public a total schooling in soundscape awareness, which has, since 1913, ceased to be divisible into musical and nonmusical kingdoms.

“The best way to comprehend what I mean by acoustic design is to regard the soundscape of the world as a huge musical composition, unfolding around us ceaselessly. We are simultaneously its audience, its performers and its composers. Which sounds do we want to preserve, encourage, multiply? When we know this, the boring or destructive sounds will become conspicuous enough and we will know why we must eliminate them.

Bernie Krause recording a tortoise in Kenya.

FROM INTO A WILD SANCTUARY (SEE REVIEW, P. 62).



### BORN TO SING

**An Interpretation and World Survey of Bird Song**

Charles Hartshorne. 1973; 304 pp. \$39.95. Indiana University Press.

Hartshorne, one of America's most passionate and original philosophers, is today nearly 102 years young and still going strong somewhere. Though his other work certainly bears more attention than it's gotten, here we only mention his fantastic book of biomusicology. Other books have been published since on the music of our avian friends and neighbors, but none is as far-reaching and speculative. Though it isn't about human attempts to make music out of nature, it sure proves that music is already out there. — DR

### OCEAN OF SOUND

**Aether Talk, Ambient Sound, and Imaginary Worlds**

David Toop. 1996; 306 pp. \$16.99 (\$18.49 postpaid). Serpent's Tail. Available from Westgate Consortium Book Sales, 1045 Westgate Drive, St. Paul, MN 55114, 800/283-3572, fax 651/221-0214.

Since penning this book, Toop—for years a writer for the fine magazine *The Wire*—has become the latest in a round of British music writers who have stepped beyond criticism to put their music where their mouths are—he's now more a composer (his music represented Britain at their pavilion at last year's Lisbon Expo) than a commentator. This volume is his dreamy attempt to set down an aesthetic for ambient music, and to relate it to the pull of the natural world.

It's a disconnected, wild ride across the world's edge-type musics, from King Tubby, Brian Eno, and Sun Ra to Ryuichi Sakamoto, Aphex Twin, and the fringes of Rave culture. A new music is here in the making; we don't quite know what it will become. The book is best in the way that it transcends information to give you a feel for the search for this music. A double-CD compilation of the same name is available from Virgin Records UK, with a huge blend of cuts of many kinds of unclassifiable music that segues smoothly from one source to another. — DR

“January 1995. Singing sands are reported to be disappearing. These beaches, scattered around the world, actually chirp as a person walks across them, making a sound that has been likened to Japanese koto music. An analysis of a sample taken from Florida's Pensacola Beach by Dr. Shigeo Miwa revealed a high proportion of pollutants mixed with the 99.7 percent pure silica quartz sand, but forty minutes of boiling in water restored the sand to full voice. Dr. Miwa's sample is now displayed in the Niwa Sand Museum in southern Japan.



FROM THE NATURE SOUNDS SOCIETY (SEE ACCESS, P. 65).



**INTO A WILD SANCTUARY**  
A Life in Music and Natural Sound

Bernie Krause. 1998; 201 pp. \$14.95 (\$17 postpaid). Heyday Books, PO Box 9145, Berkeley, CA 94709, 510/549-3564, fax 510/549-1889, heyday@heyday-books.com.

**Bernie Krause has what it takes to make a living recording the sounds of nature and selling music**

based on these sounds. His memoirs trace a dedicated life through the rare beauty of tropical jungles and the wild cutthroat nastiness of the music biz. Through legal harangues and battles for himself and for wild creatures, Krause does not give up. He's stayed committed to keeping the world listening, through many decades and changing moods in music and commerce. For his numerous recordings, see Miramar Recordings, 206/284-4700, www.miramarupx.com. —DR

“I worked with the Nez Percé in Idaho and central Washington in the late sixties and early seventies, recording oral histories, music, and natural ambient

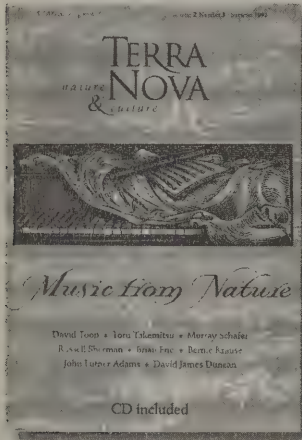
sound....One member we interviewed, tribal Elder Angus Wilson, suddenly became very pensive and quiet one afternoon when I told him that I was a musician. “You white folks know nothing about music,” he said, half-serious, half-teasing with a confrontation unusual in his culture. “But I’ll teach you something about it if you want.”

Early the next morning...Wilson led my colleague and me to the bank of a small stream, the east fork of the Wallowa River, and motioned for us to sit quietly on the ground....After what seemed like a long time, a slight breeze came up from the valley and began to stir the branches of the aspen and fir trees. Suddenly the whole forest burst into a cathedral of sound! Like a huge pipe organ with all the stops out, a giant cacophonous chord echoed from everywhere throughout the valley. Angus, seeing the startled looks on our faces, walked slowly in our direction and said, “Do you know yet what makes the sound?”

“No,” I said, shivering and irritated. “I haven’t the slightest idea.”

Without another word, he walked over to the bank of the stream and, kneeling low to the water’s edge, pointed to the reeds that had been broken different lengths by wind and ice. Slipping a hunting knife from the leather sheath hanging at his belt, Angus cut one of the reeds at the waterline, whittled some holes, and, without tuning the instrument, brought the transformed reed to his lips and played a melody. After a long while, he stopped and said quietly, “This is how we learned our music.”

“One cannot go to the ocean shore, set up a microphone, and hope to record waves. The technology simply won’t allow a successful replication of the sound. To accomplish the illusion, an audio naturalist must combine recordings of near-field, mid-field, and far-field elements just to begin to approach the experience of being at the shore.



**TERRA NOVA**  
Music from Nature

David Rothenberg, ed. 1997; 148 pp.—issue and CD. \$20 (\$25 postpaid outside the US and Canada). MIT Press Journals, 5 Cambridge Center, Cambridge, MA 02142, 617/253-2889, 617/577-1545, orders@mit.edu, http://mitpress.mit.edu, CD available separately (\$16 postpaid) from Terra Nova, 318 Cullimore, NJIT, Newark, NJ 07102.

**Our sound envelope overlaps with the vocal repertoire of many a creature on Earth.**

Some of our fellows make music outside our hearing—elephant songs too low-pitched, porpoise chatter too high. Our voice, nevertheless, evolved amidst others, specializing in distinctly human intimacy, mimicry, and broadcast, within the distinctive world of savannas and social life. With an unsurpassed intelligence and love, David Rothenberg has begun the exploration of harmonies and silences within this co-evolved soundscape. Eclectic and open to all comers—some using digital recordings and transformations, some building on real bird-song, some using jazz pacing—he has made the shift from mimicry to “operating like

nature.” That is, the music plays as a dawn song might; it attempts a deeper structure of ecosystem sound.

This issue of *Terra Nova* contains the most interesting “music-from-human-nature; music-from-Nature-nature” practitioners, both in prose and on CD. The subject being music, the CD is central. Some of our favorite cuts include loon calls played off a sampler triggered by a guitar; a recording of walrus toothwalking (tusk scraping) with lovely clarinet interludes by David; and the pied butcherbird’s amazing, deceptive (is it a bird? is it a man?) solo. Jaron Lanier plucks the thorns of a saguaro cactus like a harp, and mixes the resulting music with himself playing his shakuhachi. Heart and honesty suffuse *Music from Nature*. A new Nature/human art form is being born. Let’s get good at it. —PW

“Making music with loons is always dangerous. Their call is so perfect, so self-contained, so easy to layer over lackluster new-age piano or guitar melodies that it easily becomes a cliché, the opposite of the music from nature that we want to explore here.

“Did you know that the United States has a National Aviary and that it’s in Pittsburgh? I sure didn’t until Michael Pestel sent me this most remarkable recording. He and Kevin Shea take one of the greatest risks on this disc: They go out and jam with the birds. No fixed intention, no careful reconstruction back in the studio—just improvisation in the cage from one species to many. The sounds that come out of the aviary’s

## Music

There are plenty of examples of recorded music that seem to breathe like living things. You can find them in the best of whatever kind of music you prefer. Below, though, are a few artists who have emphasized a powerful kinship with nature in their work, either through listening closely to what's out there, or by using natural sound as direct material inside their work.

### TRANSFORMATIONS

*Hildegard Westerkamp. 1996. \$25 postpaid. Empreintes Digitales, 4580 Avenue de Lorimier, Montréal QC H2H 2B5, Canada, 514/526-4096, 514/526-4487. dim@cam.org, www.cam.org.*

Westerkamp began working with Murray Schafer's soundscape concepts in the 1970s while recording the environments surrounding her Vancouver home. Her work is remarkable for its careful and exact transformations of natural sound into musical material. These are some of the most thoughtful environmental compositions ever recorded.

### ÉCLAIRS SUR L'AU-DELÀ [ILLUMINATIONS OF THE BEYOND] Olivier Messiaen. \$15.99. Deutsche Grammophon.

Olivier Messiaen (1908-1992) was one of the greatest and most spiritual composers of this century anywhere on Earth. His music draws on the French Impressionist tradition, a unique personal harmonic theory, Indian tala rhythms, and exact transcriptions of bird songs adapted for human players. This piece contains all of his wonderful techniques and combines them into a deeply mystical meditation. He believed that God was everywhere, a Spirit that could be primarily revealed through music that emulated the world's living sounds—not only birds, but shining crystals, flowing rivers, distant planets, and stars.

### WITHIN EARREACH Sonic Journeys

*Richard Lerman. 1994 (Artifact Recordings, 1994, ART 1009). \$15 (\$20 postpaid) from*

Marsh Room, an enormous glass and steel vaulted structure housing over thirty species of birds, is remarkable in terms of acoustics and diversity of sounds. The crested oropendolas, yellow-throated laughing thrushes, blue-winged kookaburras, Inca terns, red lorries, greater flamingos, and New Guinea coral-billed ground cuckoos, to name a few, provide a range of sounds and songs whose syncopated combinations could only occur in such an enclosed space. Over the past four years, Pestel has brought various ensembles to the aviary, always with the same instructions: "to listen deeply, to play stylelessly, to enter into a multiplicity of conversations and perceive them as perfectly scored music."

WHOLE EARTH ☉ SPRING 1999

### ROOTS OF THE MOMENT

*Pauline Oliveros. 1998; 141 pp.—book and CD. \$35 (\$36.50 postpaid). Drogue Press. Available from Deep Listening Foundation, PO Box 1956, Kingston, NY 12402, 800/560-6955, fax 914/338-5986, deeplisten@aol.com, www.deeplisting.org.*

**Composer Pauline Oliveros has been a pioneer of attentiveness to the sound-world around us since the 1950s. Through her "deep listening" teachings and performances worldwide, she encourages an activism towards our sonic environment as part of the cultural environment. This book is a collage of poetic and aphoristic texts, witness to an inspiring and creative force at work in the soundscape. —DR**

“The key to multi-level existence is deep listening.

*Frog Peak Music, Box 1052, Lebanon, NH 03766, 603/448-9937. www.frogpeak.org.*

Richard Lerman is the populist of natural recording technology. He makes inexpensive (under \$1) microphones out of piezoelectric disks and attaches them to blades of grass and raindrops. Sometimes he lets hundreds of ants walk all over them in the desert. The sounds he produces and assembles are immediate, shocking, intensified, and brilliant. He'll also tell you how to make use of this technology in classrooms, at: pzo.lerman@asu.edu.

### GREATEST HITS

*Paul Winter. 1998. \$15 (\$19 postpaid). Living Music, PO Box 72, Litchfield, CT 06759, 800/437 2281, 860/567 8796, fax: 860/567 4276, pwclmr@aol.com, www.livingmusic.com.*

*Greatest Hits* draws from the landmark *Common Ground* and six other of Paul Winter's records, along with new recordings, to document his twenty-year odyssey of bringing his Winter Consort in touch with

“Listen! Not with your ears with your feet.

Listen! Not with your ears with your ancestors.

Listen! Not with your ears with your future.

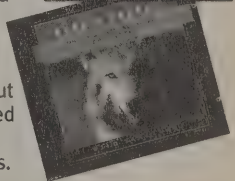
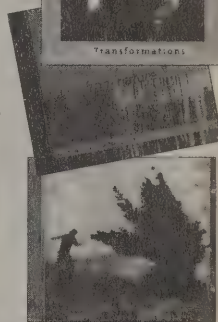
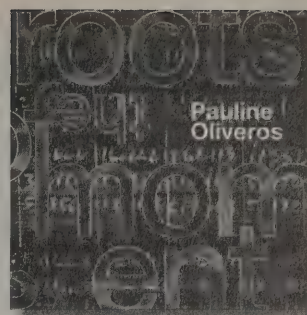
Listen! Not with your ears with your training.

Listen! Not with your ears with your ears.

Listen! Not with your ears with your elbows.

Listen! Not with your ears with your spleen.

Listen! Not with your ears with your brain.



the beautiful tones of the world's wild creatures. It includes some of the best of people jamming with recordings of animals, with a cast of stellar musical accomplices including Steve Gadd, Oscar Castro-Nieves, and Paul McCandless, not to mention eagles, wolves, and humpback whales.

### FORESTS

*Doug Quin. 1999. Price not available at time of publication. EarthEar, 45 Cougar Canyon, Santa Fe, NM, 505/466-1879, www.earthear.com. [Note: this company will not be fully in gear until April].*

Quin is the best of the next generation of soundscape composers, blending field recordings from Antarctica and Madagascar with choral singing and improvised accompaniments to create long, epic works. This is the best of his pieces to be released so far, and it is the first from a new music-and-nature label, EarthEar, which has just put out several soundscape compilations and related products, with a commitment to offer the cutting edge in music/Nature collaborations. —DR

## Web Resources

**WORLD FORUM FOR ACOUSTIC ECOLOGY**  
<http://interact.uoregon.edu/MediaLit/WFAEHomePage>.

The World Forum is a clearinghouse page for information on the recording of natural environments, sonic research, noise pollution, and compositional experiments and philosophies dealing with the wide world of surrounding sound. Start your searching here....

**ELECTRONIC MUSIC FOUNDATION SOUNSCAPE PAGE**  
[www.cdemusic.org/soundscapes.html](http://www.cdemusic.org/soundscapes.html).

Joel Chadabe's Electronic Music Foundation has a fine web page featuring selected musics that respond directly to the Earth. They also have the best selection of experimental CDs and music books for sale on the web.

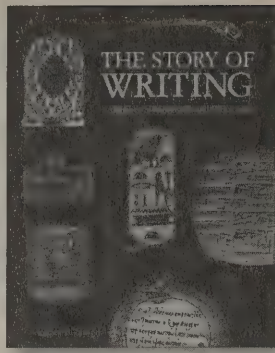
**SITTELLE**  
[www.sfere.com/sittelle](http://www.sfere.com/sittelle).

An excellent French label of soundscape recordings, not very well known in the US. All sorts of environments are represented, including "Jurassic Soundscapes," claiming to feature the sounds of dinosaurs. You can be sure some creative composition

went on with that one. Unless it's a really old recording....

**THE NATURE SOUNDS SOCIETY**  
[www.naturesounds.com](http://www.naturesounds.com)

Based at the Oakland Museum, the Society offers professional workshops on recording the sounds of the environment, and hosts concerts and conferences on listening outward toward the world. They maintain the California Library of Natural Sounds and sponsor a radio show, *Earprints*, on KPFA. They'll give you all the technical resources you need to get out there and take sound snapshots of the wilderness. —DR



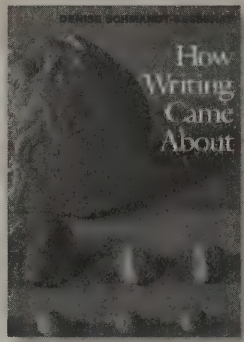
**STORY OF WRITING**  
Alphabets, Hieroglyphs  
and Pictograms

Andrew Robinson. 1995;  
224 pp. \$29.95. Thames  
and Hudson.

This is the long, amaz-  
ingly intricate story of how  
I came to be bipping out  
this review in what we call  
English, and how it came to  
be that you are able to read  
it. It's all about languages  
alive and dead, glyphs,

runes, and Rosetta Stones; wars, conquerors,  
detectives, technology, and art—attended  
through history from scratched bones to pix-  
els. I am not easily “fascinated,” but this  
book got me. —J. Baldwin

“Chinese characters are said to be “ideographic”—a word carefully avoided in this book in favour of the more specific “logographic”—that is, characters are thought to be capable of communicating ideas without the intervention of phoneticism or indeed spoken language. Thus is it claimed that Chinese speakers of Mandarin and Cantonese who do not know each other’s “dialect” and cannot talk to each other, can nevertheless communicate in writing though Chinese characters.... This, of course, would be impossible for equivalent English, French, German and Italian speakers who also use the same script.



**How WRITING CAME ABOUT**

Denise Schmandt-Besserat. Abridged edition, 1997; 193 pp. \$19.95. University of Texas Press.

Watch an archaeologist

discover and demonstrate that writing descends not from divine revelation, but from accounting. Before there were numbers, clay tokens were used to record quantities of farm products and manufactured goods. The representative tokens were sealed in clay pots (“envelopes”) for security. A likeness of the tokens—not what they represented—was inscribed on the outside of the opaque envelopes. Those symbols evolved into writing as we know it. The scholarly author invites us to learn by her side as she works out the puzzle. —JB

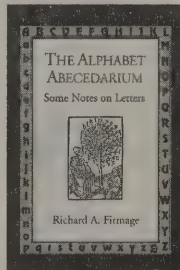
“Anthropology and linguistics suggest that people are born with only a vague sense of numbers, perhaps limited to differentiating groups of up to three objects. This idea is supported by the fact that, until the last century, societies in various parts of the world had a vocabulary limited to three number words equivalent to “one,” “two,” and “many.”



Right: List of warriors by an Ogala Sioux chief, 1883. Their names are given by signs above their heads.

**THE ALPHABET ABCEDARIUM**  
Some Notes on Letters

Richard A. Firmage. 1993;  
307 pp. \$19.95 (\$23.95  
postpaid). David R. Godine,  
PO Box 450, Jaffrey, NH  
03450, 603/532-4100, fax  
603/532-5940,  
order@godine.com,  
www.godine.com.



idea in English calling R “the dog letter” in his *Grammar*. Others have concurred, Brewer also calling it the “snarling letter” or “dog letter” in his *Dictionary of Phrase and Fable*.

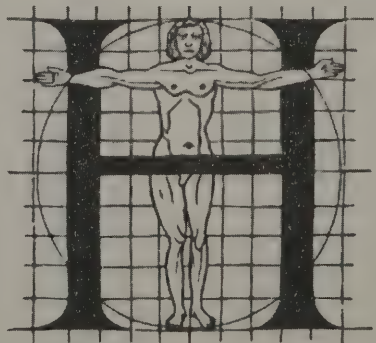
“The French poet Arthur Rimbaud wrote that “the weak-minded, applying themselves to thinking about the first letter of the alphabet can be quickly hurled into madness.”...In “A Season in Hell” he claimed to have found correspondences between the vowels—especially their sounds—and colors; although more modestly he prefaced his “invention” as

Easy as learning your ABC'S eh? How about eight pages just on the letter L? You'll see where it came from, what it means, its various forms, how it's changed over time. All the familiar letters of our Roman alphabet are treated in this witty, easily read treatise.

The book serves as an interesting condiment to the feast in *The Story of Writing*. —JB

“Because of its sound, R came to have a special name. Tory explains: “When dogs are angry, before they begin to bite each other, contracting their throats and grinding their teeth, they seem to be saying R, for which reason the poet Persius, the most pleasant of caustic satirists, calls it *Litera canina*, the canine letter.” Ben Jonson expressed the same

“the story of one of my follies.” “I invented the color of the vowels!—A black, E white, I red, O blue, U green.—I regulated the form and movement of each consonant and, with instinctive rhythms, I prided myself on inventing a poetic language accessible some day to all the senses. I reserved translation rights.”



**LAO TZU:  
TAO TE CHING**  
A Book About the  
Way and  
the Power of the  
Way



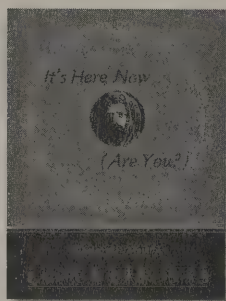
A new English version by Ursula K. Le Guin. 1998; 125 pp. \$12. Shambhala.

I fell in love with the *Tao Te Ching* at sixteen; I own a dozen translations and cherish three. The moment I knew I was going to edit the Millennium Whole Earth Catalog, I knew the *Tao Te Ching* belonged on the first page. But now, finally, a truly great English version has appeared, by a wise woman, a storyteller and poet who took decades to accomplish the task. I gave a copy of this book to my daughter for her fourteenth birthday, and inscribed inside my advice to read it every year for the rest of her life. —Howard Rheingold

to make a room.  
Where the room isn't,  
there's room for you.

So the profit in what is  
is in the use of what isn't.

[Note from Ursula Le Guin] One of the things I love about Lao Tzu is he is so funny. He's explaining profound and difficult truth here, one of those counter-intuitive truths that, when the mind can accept them, suddenly double the size of the universe. He goes about it with this deadpan simplicity, talking about pots.



**IT'S HERE NOW (ARE YOU?)**  
A Spiritual Memoir

Bhagavan Das. 1997; 312 pp. \$13.13.  
Broadway Books.

Bhagavan Das, born Michael Riggs of Episcopal parents in the Southern California 1930s, is a TRUE religious "natural." Journeying to India in the middle of the 1960s, he receives the blessings and out-of-body states of pure bhakti devotion from all the important gurus of the time, Hindu and Buddhist.

Covering himself in ashes, he receives his new name and spends six years on the road traveling through India in a blissful and devotional state, looking for enlightenment. He becomes the youthful teacher of Richard Alpert, and is with him during his transformation to Ram Dass.

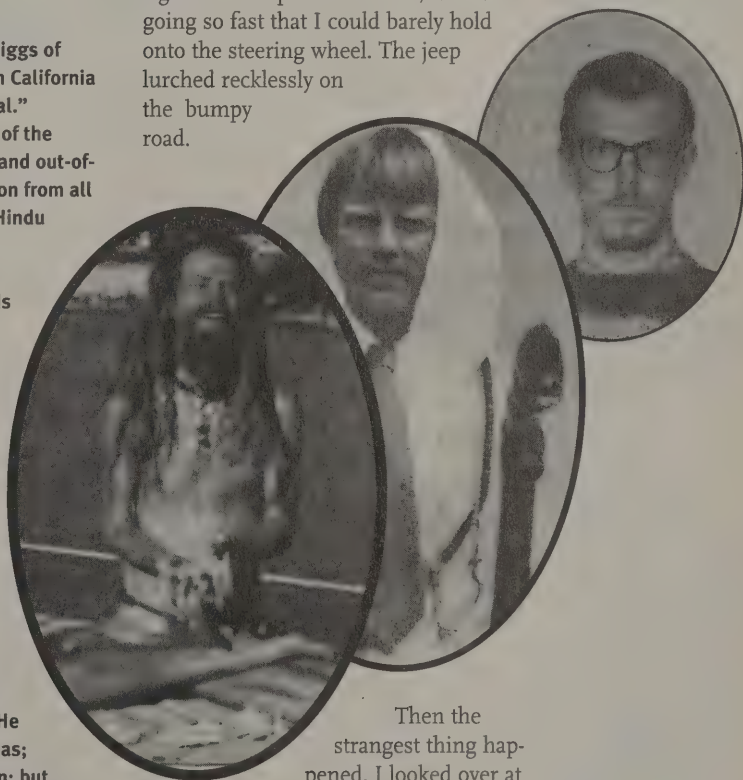
After his return to the United States, he plays the guru celebrity circuit with Allen Ginsberg, Chögyam Trungpa, and Jerry Garcia. He then drops into the mainstream, pursuing money, children, wives, and good living. He sells insurance, cars, encyclopedias; becomes born again as a Christian; but returns finally to the heart worship of the Divine Mother.

This is an amazing and articulate history of a true spiritual teacher, with the passion of devotional practice forgotten and revealed in hair-raising episodes. *I'd forgotten what it's like to feel really high.* —Joanne Kyger

"I had just finished rubbing Swamiji's feet and put him to bed. I started to lie down on my bed when my whole mind exploded in light. And with the light came the most incredible orgasm throughout my whole body. It continued for five minutes. This was the most pleasurable thing I'd ever experienced in my life. Ultimate bliss.

Something changed when that happened. It was completely light, the brightest light. It was like waking up with the sun rising right in my face. The bliss was incredible, like a sexual organ that kept going from my head down to my toes and back up again. Every cell in my body came to attention. God was making love to me. I knew it was God, and I just wanted more. This is why I was here. This was it. I felt and saw God.

"I was going about forty-five miles per hour, which is pretty fast in India. Maharaji looked over at me and said, "Jaldi karo, Jaldi karo! [Go faster, Go faster!]" I inched it up a little. Then Maharaji yelled, "Jaldi, jaldi, jaldi karo!" and I went a little faster. He didn't seem satisfied, so I flooded it all the way to Agra. As the speed increased, we were going so fast that I could barely hold onto the steering wheel. The jeep lurched recklessly on the bumpy road.



Then the strangest thing happened. I looked over at Maharaji's seat, and there was nothing but his crumpled blanket. I held onto the wheel with one hand and held the blanket with the other—and there really was nothing there! I swore to myself that I would never drive that fast again.

**"Returning To The Root**

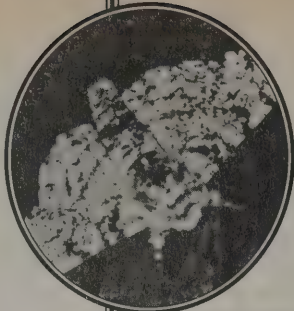
Be completely empty,  
Be perfectly serene.  
The ten thousand things arise together;  
in their arising is their return.  
Now they flower,  
and flowering  
sink homeward,  
returning to the root.

The return to the root  
is peace.  
Peace: to accept what must be,  
to know what endures.  
In that knowledge is wisdom.  
Without it, ruin, disorder.

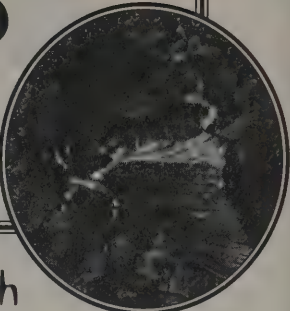
To know what endures  
is to be openhearted,  
magnanimous,  
regal,  
blessed,  
following the Tao,  
the way that endures forever.  
The body comes to its ending,  
but there is nothing to fear.

**"The Uses of Not**

Thirty spokes  
meet in the hub.  
Where the wheel isn't  
is where it's useful.  
Hollowed out,  
clay makes a pot.  
Where the pot's not  
is where it's useful.  
Cut doors and windows



# THE case of the peppered moth ILLUSION



## How Programmatic Scientists Lost Touch with the Richness of Nature

by Craig Holdrege

In high schools and college biology courses, the peppered moth has been a dramatic story of evolution via natural selection. The story goes like this:

The “peppered moth,” *Biston betularia*, occurs in light and dark...forms, both of which are shown [at left, and highlighted in the circles above]. The normal...form is a light, peppered color. A specimen of the dark type was first captured in 1848, near Manchester, England, just eleven years before the publication of *The Origin of Species*. In the years thereafter, in various parts of England, the relative frequency of the dark form was observed to increase until today, in some regions, only dark forms are found. Why the change?

The answer is almost self-evident from the photographs....In [them] we see a tree trunk of the sort found in rural England far from industrial centers: lichens covering the oak tree give it a variegated surface against which the lightly peppered moth is hard to see; the black form stands out prominently. By contrast, on trees growing in industrial areas, the lichens are killed and the trunk is blackened by soot; on such a tree it is the black moth that is protectively colored, the light moth standing out “like a sore thumb.” Birds that prey on the moths have been observed and photographed catching moths, and it has been proved that they bring about differential mortality favoring the survival of the light forms in unpolluted woods and the dark forms in industrially blackened woods.

The type of evolution represented in this story has been called industrial me-

lanism. (Melanin is the pigment that makes the wings dark.) It exemplifies the Darwinian view of evolution: a species displays phenotypic variation (light and dark forms) on which natural selection can operate. In this case, birds selectively feed on conspicuous moths, and because the background coloring changes, the moth population evolves to remain inconspicuous. Oxford biologist H.B.D. Kettlewell wrote, “Had Darwin observed industrial melanism he would have seen evolution occurring not in thousands of years but in thousands of days—well within his lifetime. He would have witnessed the consummation and confirmation of his life’s work. —Garrett Hardin. *Biology: Its Principles and Implications*, 1966

### WAKING UP

In the early 1980s I began teaching about peppered moth evolution in a university-prep, high-school biology course in Germany. Using this moth I could clearly develop the concepts of mutation and directed natural selection as factors of evolution—concepts required in the state-regulated curriculum. Since I could spend only a short time with this theme, I used textbook descriptions and other secondary sources; essentially, I taught the story described above.

In 1986 I came across a short report on new research concerning the peppered moth...and was floored. The report stated that Cyril Clarke, a British scientist, had investigated the peppered moth for twenty-five years and found only *two* specimens during daylight in their natural habitat. *What was going on here*, I asked myself. I’d been dutifully showing students photographs of the

FROM “DARWIN’S MISSING EVIDENCE,” H.B.D. KETTLEWELL, SCIENTIFIC AMERICAN, MARCH 1959.

moths on tree trunks, telling them how birds selectively pick off the conspicuous moths. Now someone who'd researched the moth for twenty-five years reported having seen no more than two moths in all that time. I immediately ordered Clarke's article, and my study of the primary literature began.

### WHERE IS THE PEPPERED MOTH?

Strangely, no one knows where the peppered moth lives during the day; Clarke's sighting of two moths in twenty-five years is more than anyone else can claim. How, then, have the moths been studied? Researchers enter forests at night, using bright lamps and virgin, pheromone-releasing females to attract and capture the males. (Females rarely enter the traps.) The moths only fly into the traps at night; they have never been caught during the day. Since one rarely, if ever, sees these moths in daylight, it is assumed they are resting somewhere in the forest. Where are they?

Cyril Clarke states, "They might be resting anywhere. The latest story is that they rest on the leaves in the top of trees, but it's not really known. The answer is that, either way, they're very good at hiding."

If the moths aren't observable during the day, where do those beautiful photographs of the moths on trees come from? In general, authors don't report the conditions under which the photos were made. I have found references only in an article by D.R. Lees and E.R. Creed, in the *Journal of Animal Ecology* (1975). They describe how the moths are killed, glued to the tree surfaces, and then photographed. Readers of other accounts will normally assume they are looking at a natural phenomenon, when in fact the pictures are composed by the researchers themselves.

### Kettlewell's experiments

In the 1950s, H.B.D. Kettlewell, the Oxford biologist, undertook an impressive series of experiments to see if he could observe under controlled circumstances what nature might be doing covertly. Kettlewell bred moths in the laboratory in order to have large enough numbers for experiments—especially of females, so hard to trap at night—and marked the underside of their wings for later identification. Light and dark forms of the moth were

then released early in the morning into both unpolluted and polluted forests.

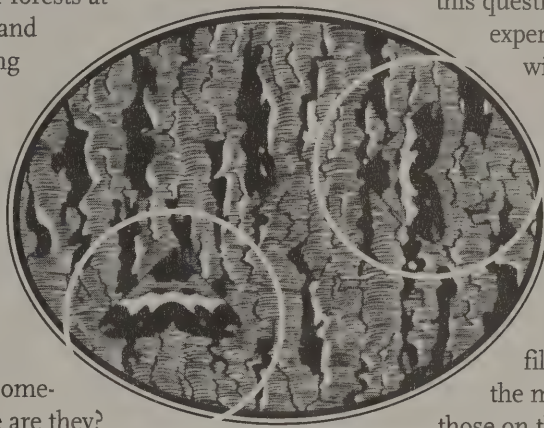
Of the 984 moths released into an unpolluted forest, Kettlewell's team recaptured almost twice as many light-form moths as dark-form; the light moths clearly had the advantage in a clean forest. From the polluted woods of Birmingham, out of 630 released moths, twice as many dark moths were recovered as light ones. There was a clear correlation: in polluted forests more dark moths were recaptured and in unpolluted forests more light moths made it through.

But the experiments do not reveal whether *birds* are feeding on the moths. Kettlewell investigated this question by performing other experiments. In collaboration with the well-known Dutch ethologist, Niko Tinbergen, Kettlewell released moths (not for recapture) onto tree trunks, where they remained stationary. The scientists hid and observed birds feeding on the moths; Tinbergen even filmed the process. Generally, the more conspicuous moths—

those on the "wrong" background according to our human standard—were indeed taken first. Camouflaged moths were also eaten, but not as many. Kettlewell concluded, "the effects of natural selection on industrial melanics for crypsis [camouflage] in such areas can no longer be disputed," and, "birds act as selective agents as postulated by evolutionary theory."

### MORE TO MELANISM THAN MEETS THE EYE

Air pollution's decimation of the lichen covering trees around industrial centers has been viewed as a primary factor in the evolution of the peppered moth, since fewer lichens would make the light form more conspicuous (against dark bark) and the dark form better camouflaged. Where air pollution has decreased over time, in forests near Liverpool, the proportion of dark moths has dropped by 30 percent while the population of light moths has made a dramatic comeback. The kicker, though, is that although green species of lichen have repopulated trees, the light species of lichen, against which the light peppered moth is so well camouflaged, is *still absent* in the forests. Similarly, in forests near Detroit, where the quantity of lichen has not changed perceptibly in the last thirty years or so, the light moths have octupled their numbers. Clearly, if the abundance or colors of lichen have not changed, it is very difficult to understand how



For moths with cross-wing stripes, camouflage includes aligning the wings with the bark. Does this type of adaptive camouflage need another look?

FROM ADAPTIVE COLORATION IN ANIMALS, HUGH B. COTT. METHUEN & COMPANY LTD., 1940.

The peppered moth was alleged to be a perfect example of differential blending—selection favoring the moth most blended with its background.

FROM *ADAPTIVE COLORATION IN ANIMALS*, HUGH B. COTT, METHUEN & COMPANY LTD., 1940.

selective predation by birds could be the primary factor in the evolution of the moth forms.

This is not the only feature that contributes to the dissolution of the clear-cut textbook story.

Lees and Creed report the following research, performed with killed, lab-bred moths pasted on tree trunks in rural eastern England. These forests had suffered little atmospheric pollution and the bark of the trees was “relatively light.” Having glued moths of both color forms on the bark of trees each morning, Lees and Creed came back to the trees at regular intervals and counted how many specimens of each type of moth were still present and how many had disappeared, presumably having been eaten by birds. The results fit conveniently with the observation of conspicuousness: the better-camouflaged (light) moths remained longer on the trees than the more conspicuous (dark) moths. When, however, Lees and Creed captured wild moths in traps (at *night*, when moths were naturally active) there were four times as many dark as light moths—exactly the reverse of what we would expect on the basis of the diurnal experiments. If birds hunt moths during the day, then the light, better-camouflaged form should have the advantage; yet the forests seem to be populated by many more dark than light moths.

Even more baffling, birds do not fly or feed at night and, as we don't know which kind of moths prefer light traps (more females than males? more darks than lights?), there is no correlation between contrived, daytime results and the conclusions drawn from equally contrived observations made at night.

### SEEING WHAT WE BELIEVE?

Stephen Jay Gould and Richard Lewontin, highly regarded contemporary evolutionary scientists, are highly critical of the “adaptationist programme,” as they call it; and one of their reasons is “its unwillingness to consider alternatives to adaptive stories.” If Kettlewell hadn't been so convinced of the truth of bird predation affecting peppered moth evolution, he might have left more room for



INSTEAD OF VIEWING EXPERIMENTS AS A WAY TO PROVE OR DISPROVE AN IDEA, WE SHOULD COME TO SEE THEM AS A WAY OF INTERACTING WITH PHENOMENA. EXPERIMENTS HELP US CLARIFY OUR IDEAS, DISCOVER PHENOMENA, FORMULATE NEW QUESTIONS, AND LOOK WITH NEW EYES INTO NATURE.

alternative explanations.

In the moth/bird-predation example we see how strongly a theoretical framework informs the interpretation of the facts. When scientists have, as Lynn Margulis puts it in *Slanted Truths*, “an uncritical accep-

tance of the mesmerizing concept of adaptation,” there is a real danger of seeing what one believes. We get oversimplified portrayals that turn science into dogma.

If we are truly interested in understanding phenomena, and not in seeing our own preconceptions in them, we must become more aware of our thinking—make it a more adequate and adaptable instrument of understanding. In performing an experiment, we are creating a simple and relatively transparent situation which is, of course, *not* identical to a natural phenomenon. We should be extremely wary of drawing conclusions that go beyond the experiment itself. Kettlewell's field experiments seem to show that birds feed on moths released onto trees in the early morning. But since the moths are not normally found on lower tree trunks during the day, Kettlewell has created (as all experiments do) an artificial situation. We need to hold back conclusions and consider alternative explanations—the guessable and the unknown. Instead of viewing experiments as a way to prove or disprove an idea, we should come to see them as a way of interacting with phenomena. Experiments help us clarify our ideas, discover phenomena, formulate new questions, and look with new eyes into nature. We can use hypotheses as a way to get started, well knowing that they need to be left behind when we confront the true phenomena, and begin to practice a flexibility of thought. The peppered moth becomes more and more like a deep question, rather than an instance of general theory.

### IMPLICATIONS FOR SCIENCE EDUCATION

In 1997 I taught the *full* picture of the peppered moth to high school seniors at a school in upstate New York whose curriculum is not state-regulated. The students were fascinated by the moth and by the contrast between the simple story and the com-



plex reality; by the process of discovery and transformation. This historical, case-study approach demands more classroom time, and more research on the part of the teacher, than does providing general overviews of material. But it brings science alive. We learn how scientists make observations, formulate ideas and questions, and test their hypotheses through experiments. We see how contradictions arise, how concepts become rigid, and then—often in the face of resistance—how they are modified or even dropped. Young people (if we have not corrupted them too much) are open-minded and interested in the world. Certainly it makes sense for them to study science (and of course other disciplines) not as codified knowledge to be memorized, but as a way of interacting with nature that leads to insights, and to ever-new questions. They begin to think of science as a process occurring in a historical context. What could be a more appropriate way to learn about the science of *life*, of biology?

A significant problem in the way science is taught, popularized, and in general filtered down to children is its portrayal as dogma. Kids “know” that in evolution the fittest survive; they “know” that the brain is a computer; they “know” that the heart is a pump; they “know” that genes determine heredity. Science courses could dissolve such dogmatic “knowledge”—really only an acquired opinion—by showing science to be a *process*. Even using limited examples, this would be more stimulating for students than imbibing large amounts of non-contextual information which, in the end, can be taken *only* dogmatically. Teaching science as process would mean reducing the use of textbooks (or at least reducing them to compendia of case studies), replacing maxims with exploration.

## BACK TO THE PHENOMENA

If nothing else, the history of peppered moth research shows the need for very basic natural history, without which experiments and theories are anchorless. Many essential questions can only be answered by direct observation—as difficult as that may be in many situations.

Clearly, we need to know more about the life history of the peppered moth. Where does it rest during the day? What are its natural predators? How far can it fly? How long do the moths live? A greater knowledge is needed about the egg, larval, and pupal stages. Alternative interpretations for melanism need to be actively pursued. Might melanism have functions unrelated to camouflage, such as increasing warmth absorption or structural stability in the wing? Or is melanism in the adult a secondary effect of differences in the larval stages

and the plants consumed? There are many possible interpretations of melanism in the peppered moth. Not a comfortable situation if we are looking for the cause of industrial melanism, but why should reality be concerned about our predilection for monocauality?

## LETHAL GENERALITIES

For decades the peppered moth has been a textbook example of evolution. Millions of students have been inculcated with this “living proof” of natural selection. The story they are being told is most likely false—or at least filled with half-truths. This is not because teachers and writers are intentionally lying, or hiding and bending facts, but because the example is used only to prove a point. Complications appear extraneous to the argument. The idea of natural selection has become ingrained in the modern mind, like a pair of spectacles you never take off. Concepts become axiomatic, and science becomes dogma. As a correlate, the complex and rich phenomena of nature degenerate into instances of overriding principles. Instead of illuminating, the idea becomes, in Goethe’s words, a “lethal generality.”

This ossification is not what keeps science alive. Vitality in science comes from researchers doubting conclusions, making new observations and constructing new experiments; from scientists thinking with originality. Science teaching need not only serve the codified “body of knowledge.” It can also serve ongoing exploration and the continual renewal of ideas. Since there is “more to melanism than meets the eye,” peppered moth research can be an excellent teacher of the living scientific process. ☺

Craig Holdrege is the high school teacher every parent yearns for. He makes his kids ponder and wonder and gives the students great ideas to bring home to the table. He has written the best book on the state of genetics and biotechnology, *Genetics and the Manipulation of Life* (see Whole Earth No. 93). He is a dedicated student of Rudolph Steiner and the philosophies of the Waldorf Schools. He has just founded The Nature Institute, dedicated to whole-organism biology, an end to genetocentrism, holistic ecology, creating a biological context for technology, and phenomena-centered science and nature education. We thank Lynn Margulis for pointing Craig and his work to Whole Earth. The Nature Institute, 169 Route 21C, Ghent, NY 12075, 518/672-0116, nature@taconic.net.

The life cycle of the peppered moth has yet to be explored. Maybe adult color differences are the consequence of an early life stage? (Life cycle of the cabbage moth shown.)



### SOURCES:

“THE SPANDRELS OF SAN MARCO AND THE PANGLOSSIAN PARADIGM: A CRITIQUE OF THE ADAPTATIONIST PROGRAMME,” S.J. GOULD AND R.C. LEWONTIN. *PROCEEDINGS OF THE ROYAL SOCIETY OF LONDON*, 1979.

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*THE EVOLUTION OF MELANISM*. H.B.D. KETTLEWELL, CLAREDON PRESS, 1973.

*INDUSTRIAL MELANISM: GENETIC ADAPTION OF ANIMALS TO AIR POLLUTION*, D.R. LEES. ACADEMIC PRESS, 1981.

DETAILED SOURCES AVAILABLE FROM THE NATURE INSTITUTE.

**VULTURE**

**Nature's Ghastly Gourmet**

Wayne Grady. 1997; 110 pp. \$22.50 Sierra Club Books.

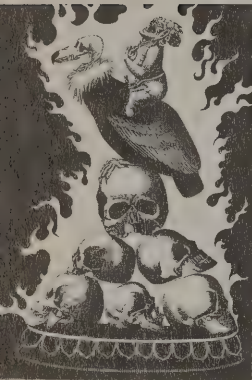
The vulture's natural ecological role as a recycler of the dead includes dead humans, and Wayne Grady's description of the Sky Burial practices of Tibetan Buddhists and the Parsee of India confronts our squeamishness. As mourners watch flocks of vultures descend and devour the dismembered carcasses of their loved ones, we cannot help imagining our own parents or children in such a scene. This book doesn't let us avert our eyes. My favorite photo is of a Cape vulture with its head fully inserted into the eye socket of a water buffalo. The vulture's niche as carrion eater "test[s] our unconditional love of nature."

The text refers to earlier ornithological texts (Audubon, Darwin, Bartram) as well as a wider array of sources (Leviticus, Mayan mythology, Pablo Neruda) to flesh out our relationship with vulturesque natural history, mythology, social history, and literature.

Rather than writing discrete species accounts, Grady prefers comparisons to help us understand ecological truths. He tells us, for example, that, "Although in captivity black vultures have no trouble breeding at higher latitudes, their failure to expand into northern regions probably has to do with their feeding strategies. Turkey vultures can more easily find small food items by smell—black vultures, which have no sense of smell, need a large and consistent source of food."

Grady's book deserves a place on your natural history shelf—or take it out of the library and read it in about two hours, check out the outrageous pictures, and return it. Or just wait for the paperback.

—Jules Evens



but most of them would rather kill their own food than find it or at least prefer their trouvaillies to be as fresh as possible and will turn up their noses at carcasses in advanced stages of putrefaction. They don't have the stomach for them. Vultures do. The acid in a vulture's digestive tract is so strong that botulism and cholera bacteria that would wipe out whole villages pass through a vulture like milk through a baby....Vultures can afford to wait until the jackals are finished before lying down with the lions.

“By even the most liberal standard of beauty, vultures—at least on the ground—are not beautiful. Their bald heads and bare, serpentine-like necks are too readily associated with death and decay; their featherlessness enables them to slide their heads into the inner reaches of putrid carcasses without having to spend a lot of time grooming afterwards.

“Seven of the restricted-range birds of this EBA are classified as threatened, including those species which are believed to be most vulnerable to habitat destruction because they have particularly small ranges or are confined to a narrow (and relatively low) altitudinal band.



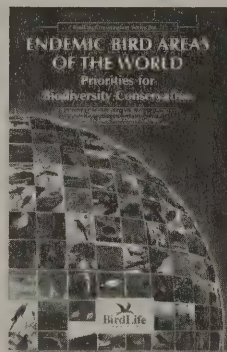
Hand puppet feeds a chick at the L.A. Zoo.

“From a purely evolutionary standpoint...it makes sense to have a taste for food nothing else on the planet except microbes and maggots will touch. The world is full of scavengers,

**ENDEMIC BIRD AREAS OF THE WORLD**

**Priorities for Biodiversity Conservation**

Alison J. Stattersfield, Michael J. Crosby, Adrian J. Long, and David C. Wege. 1998; 846 pp. \$60. BirdLife International, Wellbrook Court, Girton Road, Cambridge CB3 0NA, UK, +44(1223) 277 318, fax +44(1223) 277 200, birdlife@birdlife.org.uk.



women's hats.)

This is the first atlas on endemic birds of the planet. Endemic means confined to a relatively small area of the Earth, and locally evolved and adapted. Twenty-five percent (2,161 species) of the bird family lives in such restricted neighborhoods.

By summarizing

the location of all known endemic birds, BirdLife International steps forward with the most practical, caring, and realistic whole-Earth conservation atlas. Practical, because we now know where to focus our energy most effectively, and realistic because we now know that there must be some loss of species because of politics, lack of funds, and general chaos. Seventy-four percent of all threatened birds are endemics. BirdLife is dedicated to cutting avian losses.

Each Endemic Bird Area (EBA) description includes a great map, key habitat, main

threats, and survival status. For me, a maniacal naturalist of oceanic islands and sky islands (mountains surrounded by impassable barriers such as a desert), *Endemic Bird Areas* spurs my longing for exploration and travel, fulfills my lust for avian biogeography, clarifies my own bioregional bird community by placing it in the global context, and brings me cheer that so many other humans are willing to work hard to keep our winged friends from perishing. —PW

“General Characteristics—This EBA includes mountains on the Indonesian island of Sumatra and in Peninsular Malaysia.

...The natural vegetation of Sumatra and Peninsular Malaysia is tropical rain forest, characterized by high temperatures and rainfall which vary little over the year. The restricted-range birds occur in montane forest down to c. 500 m.

“Restricted-Range Species—Of the twenty species confined to this EBA,

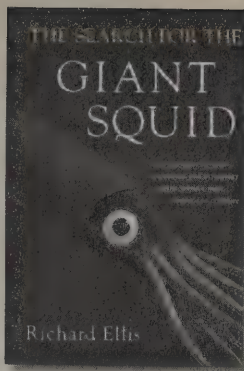
Once again, professional and amateur bird lovers have trailblazed conservation biology. (Remember, it was bird lovers who started conservation of individual species by protesting the use of egret feathers for

The Sumatran Cochoa *Cochoa beccarii*, a rarity in the Sumatran and Malaysian endemic bird area (EBA) mapped here.



## THE SEARCH FOR THE GIANT SQUID

Richard Ellis. 1998; 322 pp. \$35. The Lyons Press, 123 West 18th Street, 6th Floor, New York, NY 10011, 800/836-0510, 212/620-9580, fax 212/29-1836, www.lyonspress.com.



special effect from Industrial Light and Magic. The ultimate cyber fantasy, they communicate with each other and their environment by morphing. I am inconsolably jealous of their abilities.

But their cousin the giant squid is the Zeus of the alien Pantheon. Beginning with Aristotle, *Architeuthis* has haunted the imagination of mankind. The Sea Monster has remained the embodiment of what we fear and cannot control in the universe.

Could it be that at this late date there is still an animal on Earth—much less a sixty-foot-long monster with a deadly beak, eyes the size of hubcaps, and fierce talons on the ends of its tentacles—that has eluded the encroaching eye of *Homo sapiens*? We know of the giant squid through a pittance of washed-up carcasses and from beaks recovered from the stomachs of sperm whales, its only known predator. We've never directly observed them alive, so they remain a mystery. Given how smart smaller octopi and squid can be, one has to wonder if the big-brained giant is avoiding us because it knows better.

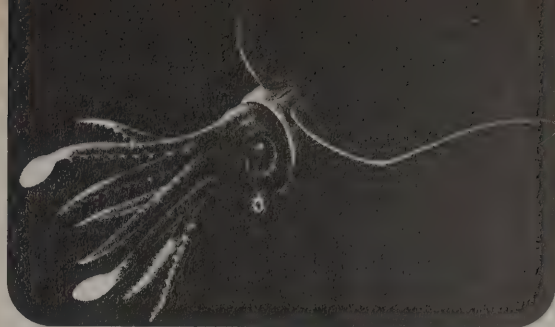
Cephalopods are the aliens on Earth. They are the "other" smart creatures; while we people are (according to us, anyway) the valedictorians of the vertebrates, the squid, octopus, and cuttlefish show us that mollusks are fully capable of evolving into soft-bodied, quick-witted competitors.

The most entrancing cephalopods are the giant cuttlefish and the mimic octopus, which are creatures that come with virtual reality as a built-in feature. They can project patterned images on their skin and change shape like a

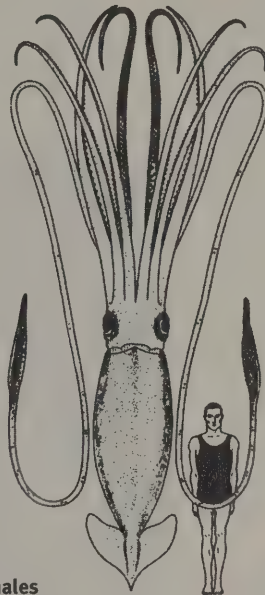
My most happy encounter with a giant squid (dead, fortunately), was with the celebrated new arrival at the American Museum of Natural History in New York. Through the good graces of Niles Eldridge I was able to arrange a private viewing of said squid for Oliver Sacks as a birthday present. This specimen, described as a baby (a mere 25 feet long), had been trapped in a net by fishermen off the coast of New Zealand. It was kept in a vast stainless steel vat secured by chains and padlocks. A creepier scene than any in the "X-files." The latest thinking is that the specimen is not a baby at all, but a male—and that perhaps only females achieve Brobdingnagian scale. Not Zeus, but the Amazon Queen of the deep!

Richard Ellis has written the definitive giant squid book, achieving a superb blend of scientific reporting and cultural history. If you are suffering malaise because you worry that natural mystery is all but conquered, this is the book for you. Until, that is, someone actually succeeds in seeing a giant squid in action. There are plenty of people trying; in stealthy submarines, or by attaching remote cameras to the backs of sperm whales. This might be your last chance to appreciate an ancient mystery before it is revealed.  
—Jaron Lanier

"Squids are not part of our world, not elements of our consciousness. They are endowed with features—hooks, claws, suction cups, lights, beaks, a mucous coating, multiple appendages—that we rarely encounter in the more familiar terrestrial creatures. They live out of sight, underwater, at depths we cannot plumb, in numbers we cannot imagine. Their strength, their competence, and their predominance in their oceanic habitat have inspired some authors to classify them as



an alternative form of intelligence on the planet. Their unfamiliar shape, with a cluster of arms at one end, eyes in the middle, and a tail at the other end, has only added to the impression that they are alien creatures from an unknown world—which is exactly what they are.



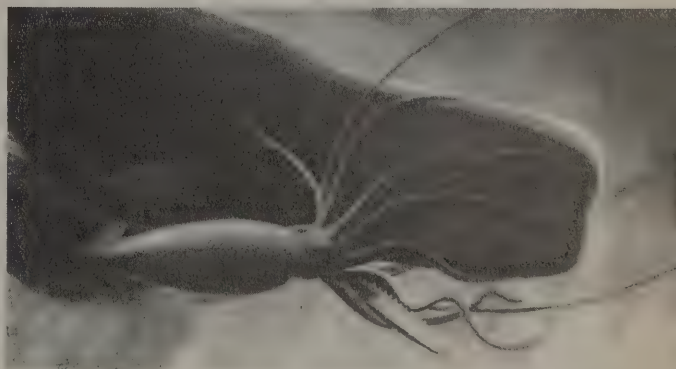
"No photograph of a crumpled carcass can hope to do justice to a huge squid that, in its dark and cold natural habitat, swims almost weightlessly, with its great lidless eyes seeking the slightest glimmer in the blackness. And so far, there is no movie or video that shows a living giant squid, so how can one communicate the impossible size and exotic appearance of this fabulous creature, the world's largest invertebrate?"

"Giant squid most likely perform a more cumbersome, less populous version of the mating death dance of *Loligo* [market squid], but we must strain our imaginations to conjure up a picture of two of these apparitions (the females of most squid species are larger than the males) locked in a twenty-arm embrace, where the tail fins of the female can be sixty feet from those of her mate. Do they flush unseen crimson in the blackness of the abyss?..."

My photophores are bigger than yours; *Taningia danae* flashes the lemon-sized light organs at the end of its arms.

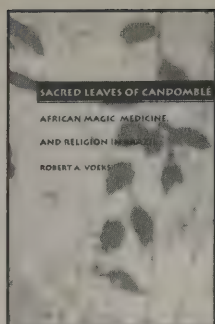
Size IS everything; man relative to a giant squid. One day we will resolve the enigma of *Architeuthis*.

Depth with a view: the sperm whale, the giant squid's only known predator, may be our best conscript in the search for this elusive cephalopod.



fourteen are endemic to Sumatra and two to Peninsular Malaysia, and four are shared, including the monotypic endemic genus *Psilopogon*. This EBA has affinities with the other Greater Sunda montane EBAs, sharing twelve restricted-range species with the Javan and Bali forests (EBA 160), and five with the Bornean mountains (EBA 157).

"Threats and Conservation—The main threat to the birds of this EBA is deforestation. On Sumatra, at least a third of the natural area of montane forest on the island has been lost, and two-thirds to four-fifths of the lowland forest, and natural vegetation is probably being lost faster than in any other part of Indonesia. Agricultural encroachment by shifting cultivators is an important cause of deforestation, which is affecting large areas of hill dipterocarp and lower montane forest, even within gazetted protected areas.



**SACRED LEAVES OF CANDOMBLÉ**  
African Magic, Medicine, and Religion in Brazil

Robert A. Voeks.  
University of Texas Press. 1997.

This is a good one: good writing, a personal touch, good scholarship, good fieldwork.

What ethnobotany should be.

Candomblé is an Afro-Brazilian religion closely related to Macumba and Umbanda with hundreds of thousands of practitioners. The religion centers around Yoruba deities, the orixás, who came to the New World across the middle passage with slaves from West Africa. Through drumming and dancing, the adherents enter trance states in which one of the gods enters the dancer and takes possession of his or her body. In this state, they can receive messages from their guardian spirits, can reconcile disharmonies, and can generally give increase to the vital energy (the axé), both individual and collective. All this and much, much more is revealed in *Sacred Leaves of Candomblé*.

Robert Voeks's breadth is apparent from his bibliography, where all combinations of history, botany, and religion mix. — Dale Pendell

“The divisive forces that yanked apart the Cretaceous African–South American biome

have been counteracted by five centuries of human-induced floristic reconciliation, as close to a continental reunion as Africa and South America will ever witness. Thus, the floristic landscape that Africans encountered in Brazil, dominated by sugar, cacao, oil palm, coffee, and a host of pasture grasses, was pretty much what they had left behind in Africa. The major botanical differences, found mainly in the old-growth forests, dwindled as deforestation progressed. Afro-Brazilian ethnobotany would never be based on knowledge of the jungle. Their understanding of plants, particularly the healing flora, would be assimilated from indigenous sources, picked



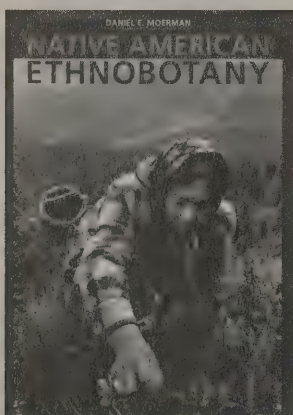
up from their European masters, and, ultimately, blended with the traditional knowledge of their ancestors.

“To say that the majority of white Brazilians reject the legitimacy of Candomblé healing practices is an understatement. Reactions generally range from visceral repulsion to mild amusement. At the extreme, Candomblé is seen as impregnated with devil worship and macumba, and its practitioners as embracing the lowest form of heathenism. Those with a milder reaction see it as a jumbled compendium of European superstition and African hocus-pocus, a benign blending of rituals meant to attract the simple-minded and the desperate. The notion that Africans and their descendants could be masters of a serious and relevant intellectual tradition seems beyond the pale of most neo-Europeans.



Top right: This Candomblé priestess' attire associates her with Oxum, goddess of vanity among the orixás (nature gods).

Right: Possessed by his female deity, a Candomblé spiritual medium (*pai-de-santo*) dons representative clothes.



**Native American Ethnobotany**

Daniel E. Moerman. 1998; 927 pp. \$79.95. Timber Press.

Timber Press continues its tradition of excellence in books botanical with this compendium of Native American plant usage. A reference book listing over 4,000 plants, *Native American Ethnobotany* is the product of twenty-five years spent collecting and integrating all the information the author could find from the ethnobotanical literature of the last 150 years.

The book's catalog of plants covers nearly 600 pages, followed by notes and a bibliography. It includes a 140-page index of tribes and an extremely useful index of usages.

The catalog of plants arranges entries alphabetically by genus and species. Bullets highlight usage categories such as “drug,” “fiber,” or “food.” Each usage section lists tribes that made such use of the plant, followed by particulars of how the plant was used and a bibliographic reference. This innovative arrangement, along with the indexes, makes the book readily usable.

For example, I've wondered whether or not I am the only person in the world who smokes *Prunus emarginata* leaves. Looking under

*Prunus emarginata* in the catalog of plants revealed usage of its bark and inner bark for medicinal purposes by many tribes, but no records of the leaves being smoked. Then I checked the index of usages under “smoke plant.” There I found a listing for “*Prunus*: Paiute, Northern.” It didn't list which species of *Prunus*, but by looking in the index of tribes under “Paiute, Northern,” I found that they used both *Lomatium dissectum* and *Prunus virginiana* as smoke plants. Close enough, and the *Lomatium* reference was worth the search.

The index of usages should be invaluable to herbalists. For instance, more than a hundred plants can be found under “burn dressing”; most other categories are as large or larger. Along with medicinal uses, *Ethnobotany* includes food, fiber, dye, and ceremonial usages for plants.

Congratulations to Timber Press for doing it right. It's pricey, but you can sell whatever you were using before....Hmmm. Or maybe sell some clothing. Or put off buying new tires...something like that. — Dale Pendell

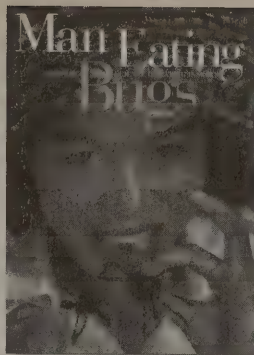
- “*Mentzelia involucrata* S. Wats., Whitebract Blazingstar
- **Food**—Cahuilla Porridge Parched seeds ground into flour and used to make mush.
- **Other**—Kawaiisu Toys and Games Leaves thrown by children at one another because they stick and were hard to remove.

**MAN EATING BUGS**  
The Art and Science of Eating Insects

Peter Menzel and Faith D'Alusio. 1998; 192 pp. \$19.95. Ten Speed Press.

Are insect eaters the last frontier of hunter-gatherers? Or will insects and spiders and their relatives now become mini-livestock? Maybe 2,000 species around the globe provide substantial protein, fat, minerals, vitamins, and delectable tastes. Even Leviticus recommends locusts, grasshoppers and crickets. Among Swedish kids, tequila-worm lollipops have become the rage. Grasshopper prices are rising in Thailand as farmers experiment with cutting pesticides and supplementing their income with hopper herding. Once tofu was totally yuk to the American palette. Now it's maybe the moment to re-think a dish of vaguely crab-tasting scorpions or crispy Cajun meal-worms.

*Man Eating Bugs* is by far the most informative, fun, and mind/stomach-bending book ever on insect eating. The narrative photos by Peter Menzel of *Material World* fame (WER No. 86, Whole Earth No. 90), have a way of looking innocent until you consider what's happening. The text by Peter and Faith



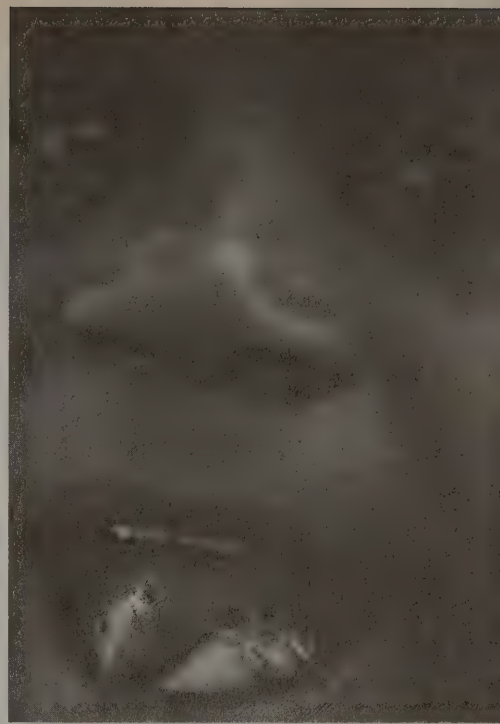
D'Alusio chronicles their journeys with lovely anecdotes of each day's new events. —PW

“It's foolish to greet the idea of eating insects with revulsion. Certainly one shouldn't think of insects that way; there are way too many of them, and they're too important to life....It's an invertebrate world. May Berenbaum...told us that the estimated total number of insects on Earth is 10 quintillion, or

10,000,000,000,000,000,000. Some termite and ant colonies have several million members; locust swarms can contain up to a billion. Given the preeminence of insects in this world, detesting them all is a little foolish—it's like choosing to hate the house you live in.

“The chef and manager appear with a special treat—an appetizer of live scorpions. First the manager puts

them in a small bowl of water. The scorpions aren't happy about this. They start thrashing around. A good sign, I decide. If we are going to eat live scorpions, let them be very alive. With chopsticks, the manager removes the scorpions from their bath and drops them in rice



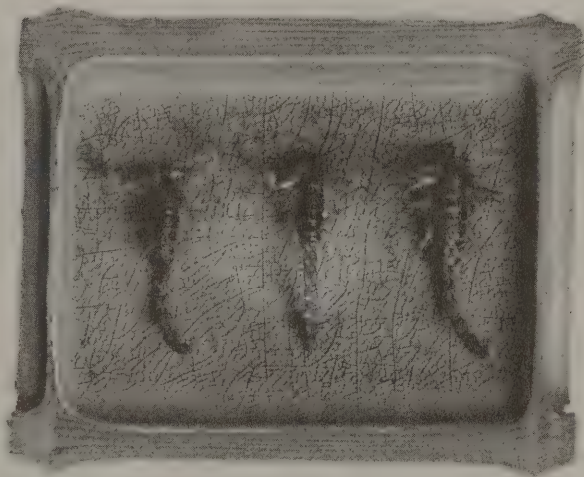
A protein-rich snack of roasted stink bugs stretches a yam-and-taro diet in the Baliem Valley, Indonesia.

wine for a few minutes. The scorpions stop struggling and go into a coma. The chef then scissors off the tail stingers and poison sacs and arranges the scorpions on a plate....I brace myself, but the experience isn't so bad. It's very chewy with a gutsy, almost fishy taste, but it's overpowered by the wine flavor....

Wang Lingyum, the manager, is a refined young woman who seems completely out of place in this industrial backwater. Scorpions are a fixture on the menu—the restaurant is famous for them. People like them for snacks, she says.

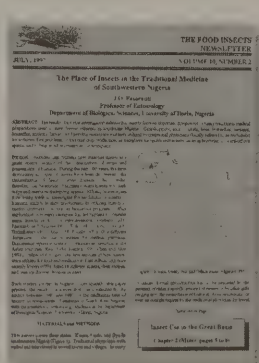
We try the scorpions she serves and there's something to be said for ambiance and presentation. The scorpions arrive with a fancy garnish of maraschino cherries and radishes sculpted to look like butterflies. The scorpions themselves tasted just like the others—like sautéed twigs, but good ones.

Scorpion entrée in China; artful presentation eases a risky culinary proposition.



- “*Panicum obtusum* Kunth, Obtuse Panicgrass
- **Drug**—Isleta *Dermatological Aid* Grass characterized as making the hair grow rapidly.
  - **Food**—Apache, Chiricahua & Mescalero *Sauce and Relish* Seeds ground into gravy, mixed with meat. Navajo, Ramah *Fodder* Cut for hay. *Forage* Good forage.
  - **Other**—Isleta *Soap* Ground stolons mixed with soapweed and used in washing hair.

“The 10 plants with the greatest number of uses as drugs by Native Americans are  
*Achillea millefolium*, common yarrow  
*Acornus calamus*, calamus  
*Artemisia tridentata*, big sagebrush  
*Lomatium dissectum*, fernleaf bisquitroot  
*Prunus virginiana*, common chokecherry  
*Artemisia ludoviciana*, Louisiana sawewort  
*Oplopanax horridus*, devil's club  
*Juniperus communis*, common juniper  
*Mentha canadensis*, Canadian mint  
*Urtica dioica*, stinging nettle



**THE FOOD INSECTS NEWSLETTER.**  
 Florence V. Dunkel, Ed. \$9/yr (3 issues). Free to active Peace Corps volunteers and public libraries. Florence V. Dunkel, Dept. of Entomology, 324 Leon Johnson Hall, Montana State University, Bozeman, MT 59717, 406/994-5065, fax 406/994-6029, uefyd@montana.edu, www.hollowtop.com/fin\_html/fin.html.

Up-to-date entomophagy. Meetings, new literature, great believe-it-or-not. —PW

# MARIJUANA

AMERICA'S MOST PROFITABLE PLANT NOW BRINGS AN EARLY WARNING OF SUBVERTED CONSTITUTIONAL RIGHTS, BRAIN-WASHED JURIES, BLOATED FEDERAL POWER, JUDICIAL RACISM, AND HAMSTRUNG LAWYERS



BY TONY SERRA

**W**e all appreciate that California voters passed Proposition 215, which allows for medical usage of marijuana for seriously ill Californians: a person with a recommendation from a doctor is entitled to grow and use marijuana. Now legal authorities at all levels of law enforcement admit up front that they are doing everything they can to de-actualize that law. That is, they will arrest people who have doctors' recommendations. They will seize plants grown by terminally ill people and turn them over to the district attorney. Most of the time, if it's a bona fide medical-use case, district attorneys won't prosecute, but the medicines—the marijuana plants and the marijuana in smoking form—are seized and never returned.

Worse than that, they outlaw the marijuana clubs and the people who grow for them. They give lip service to the legalization of milk, and then outlaw the cow.

Through the supremacy clause, federal authorities have claimed the right to interdict these organizations. Prosecutors have applied mandatory sentencing minimums using the fed-

eral system, which does not recognize 215. They have sought and accomplished the closure of a number of clubs through federal injunctions.

The feds, claiming separate-sovereign status, are stultifying the will of the electorate. That's a slap in the face of the democratic process, and a slap in the face of the law-and-order approach that 215 has established. They always say, "If you don't like the law, then change it!" Then when you finally change just one of the untold numbers of onerous laws, they won't actualize it, they won't give it full faith and credit, they won't even honestly enforce it.

Back in the sixties, we believed that marijuana was going to be decriminalized. We're now in the latter part of the nineties. For the small percentage of decriminalization that applies to medical use, law enforcement and often district attorneys won't give us the benefit of the law. They're very punitive and very retaliatory. They don't like the law, and they're not fulfilling the mandate of the electorate.

I'm painting a very grim and pessimistic picture of what's going on in the judicial process. Normally, I'm an optimistic, positive-oriented person. But I think that any criminal-defense

practitioner will tell you that the war on drugs is a false premise, an illusion. Under this rubric in the last decade or so, we as a culture have been effectively stripped of constitutional rights. Consider motions to suppress evidence, where the defendant claims unlawful seizure, or that his right to privacy has been invaded, or that the police had no probable cause or no search warrant. In the sixties and early seventies, we would win four out of five of these cases because law enforcement typically failed to meet legal requirements. Now, we're lucky to win one out of twenty. Judges do not want to apply constitutional standards with full force and vigor against law enforcement, because they're fearful of being viewed as lenient in this war on drugs.

Jurors have become mad dogs, they have been so conditioned by media and police propaganda. I got a case in Boston where the jurors believed, almost, that marijuana was shot into your veins like heroin. They had no idea what marijuana was, they were merely recipients of propaganda. In a political drug case where law enforcement's word is pitted against a private citizen's word, attorneys will now say, "You have to establish five

reasonable doubts; one reasonable doubt won't do it." Juries want to adopt the prosecution version. They've been brainwashed. They believe that crime is rampant, that drugs lead ultimately to robbery. We're in a very, very constitutionally threatened atmosphere based on the mass mentality of the populace.

I can still win a jury trial. At this office, we do marijuana case after marijuana case, and we win many of them. But it's nothing like the sixties, when all levels of society showed a robust interest in actualizing constitutional rights and expanding the common denominator for justice. It is fairly dismal out there now. We're hopeful that the pendulum will swing back. We look at things like elections (in this state, the governor's, attorney general's, and senatorial races). Ultimately, we look to the media to promote more honesty so the general populace isn't spoon-fed war-on-crime propaganda. We look to other levels of media, to the film industry, to change a lot of its crime

or police hero-worship plots and narrative. If we can't turn public attitude, law enforcement, and the courts around, we are heading toward the worst repression in our country's history. ☸

Tony Serra has been the most effective jury lawyer on marijuana and other drug-related cases in the United States. He helped keep Hacs Horvath, one of our staff members, out of jail when he was entrapped in an LSD sales caper. He has been an outstanding spokesman for the integrity of the judicial process, independent of political influence. Other segments of this conversation appeared in Whole Earth No. 95.

**NOT the same thing as searching the trunk of your car. Since trunks are hidden from casual view in a way that the passenger compartment is not, they have more protection under the Bill of Rights. Good to know, huh?**

The book is filled with edifying information, with sections on every aspect of marijuana law: possession vs. sales, growing, paraphernalia, even sales tax. Boire includes chapters on constitutional law, evidence, entrapment, informers, and all sorts of other ways that Big Brother collects information on you. In the gardens chapter, he explains the concept of curtilage (how to create a garden that is part of your home, and thus enjoys added protection). There is stuff on police, medical marijuana, a lot on searches, and what to do if you are arrested.

Some of Boire's sagest advice is not to consent to a search. Consenting to a search waives your constitutional protection. When an officer asks, "Do you mind if I look in your trunk?" you can apologize and say that you are too busy, that your mother is sick, or that your attorney has strictly advised against it. Polite, but firm. They may search your trunk anyway, or hassle you in some other way, but if you are carrying, don't say 'ok.'

Richard Glen Boire is also the author of the *Entheogen Law Reporter* and *Sacred Mushrooms and the Law*,

equally useful works that further attest to Counselor Boire's commendable community spirit.  
— Dale Pendell

“ Appendix B: Wallet Cards.

Clip cards. Laminate. Keep in wallet or purse. Give 4th Amendment card to officer who asks you to consent to a search. Give 5th/6th Amendment card to officer who reads you your Miranda Rights.

## Medicinal Marijuana Activism

### Americans for Medical Rights

1250 6th Street, Suite 202,  
Santa Monica, CA 90401,  
gina-amr@lainet.com.  
Website under construction.

AMR works on legal medicinal marijuana issues at the state level. It helps qualify ballot initiatives, campaigns for their passage, and then works to see that they are implemented and that eligible patients are able to obtain and use marijuana safely.

### Marijuana Policy Project

PO Box 77492, Capitol Hill,  
Washington, DC 20013,  
202/462-5747, 202/232-0442, mpp@mpp.org,  
www.mpp.org.

MPP lobbies full-time for marijuana law reform at the federal level and assists groups at local and state levels. Medicinal marijuana is a major focus,

including gathering endorsements for legal reform from medical associations, supporting legislation to allow states to determine their own policies, and lobbying the National Institute on Drug Abuse to make marijuana available for FDA-approved research.

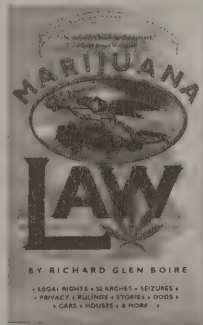
### The Lindesmith Center

400 West 59th Street, New York, NY 10019, 212/548-0695, fax 212/548-4677, tlcweb@sorosny.org, www.lindesmith.org.

A project of George Soros's Open Society Institute, TLC is a policy research institute seeking alternatives that minimize the adverse effects of both drug use and drug prohibition. Actions include serving as counsel in a California class-action suit to block federal punishment for medicinal use, analyzing and publicizing experiences of other countries, and maintaining extensive physical and online libraries for medical and legal research.

## MARIJUANA LAW

Richard Glen Boire. Second edition 1996; 271 pp. \$15.95 (\$20.95 post-paid). Ronin Publishing, PO Box 8843, Emeryville, CA 94662, 510/548-2124, fax 510/5487-7326, roninpub@aol.com, www.roninpub.com.



We all hope, of course, that this is a book you will never need. More, that it would be a book you need never need.

Sadly, if the first word of the title is more than just something you occasionally read about in the newspaper, knowing is better than not.

Attorney Boire presents not only the laws, but a lot of his experience and expertise. For example, if you are stopped in your car, several conditions could allow police officers to search the passenger compartment without a warrant. These conditions include the officer reasonably believing that you have a weapon in the car, placing you under arrest, impounding your car, or having probable cause to believe that you have marijuana in the car. But, as the cases Boire presents show, that is

### NONWAIVER OF FOURTH AMENDMENT

I have been advised never to waive a constitutional right protecting my liberty. In respect for the wisdom of our founding fathers who knew well the dangers of dictatorial government, I hereby invoke my rights as guaranteed by the Fourth and Fourteenth Amendments to the United States Constitution.

I do not consent to a search of my person, my belongings, my automobile, my home, or any other item. I also do not consent to any further detention of my person, my belongings, my automobile, or any other item.

If you search me or detain me without the requisite justification under the law, you are hereby advised that I will take all possible legal actions against you personally as well as against your employer.

Signature: \_\_\_\_\_

# SCENARIOS

A HEARTFUL  
LOOK AT  
THINKING THE  
UNTHINKABLE



DOUGLAS DUNN IN COCCA MOCCA. PHOTO: BEATRIZ SCHILLER.

**S**cenarios are stories of the future, produced from choreographed and improvised group conversations and research. For the last quarter-century, military and corporate decision-makers have employed and refined scenarios as an alternative to single-minded strategic plans, predictions, and forecasts. Those overly precise strategies—such as Stalin’s always unachievable Five-Year Plans—never worked, just as efforts to forecast a specific future oil price always foundered in an unpredictable world. In contrast, scenarios visualize a series of futures that can arguably be considered equally possible. Each story weaves a plot balancing certainties and unknowns. Art Kleiner tells how they operate in groups and organizations (page 77).

Whole Earth became interested in scenarios because they have spread beyond the military and corporate worlds. I have, for instance, been part of scenario exercises for the UN Development Programme (What futures might emerge if UNDP accepts corporate funding?), the US Forest Service (What futures will serve what constituencies?), and the World Wildlife Fund (What futures might save the Chihuahuan desert’s unique habitats?).

Even more exciting scenarios have visualized futures for post-apartheid South Africa and for a peaceful Colombia. The facilitator of these sessions, Adam Kahane, recounts the quest for a commons of mutual interest among many divergent, and sometimes antagonistic, participants (page 82).

Facilitators insist that scenarios are not predictions or forecasts, but they enjoy telling how one or another scenario got it right. (See the classic story of Shell’s “seeing” a future with lower oil prices, when everyone else said they could only go higher). Of course, organizations use many other tools to “think outside the box,” as the cliché of the moment has it. I used to take corporate managers rafting down rivers, preferring box canyons to boxed offices for inspiring adventurous intellect. Decision makers have long used oracles and divination (I Ching sticks or astrology) to break out of brain chains. Science fiction also evokes scenarios in presenting possible futures. John Clute (pg. 101) reflects on science fiction, scenarios, and society.

It is time, we decided, to bring scenario debates to a broader public. Scenarios have lately been proposed as conversations for planning for survival or profit; as anti-groupthink tools to open imaginations and find peaceful means to mutually desired ends; and as aids to empower citizens to change

their destinies. The conversation sparkles throughout this section. Kees van der Heijden, Vicki Robin, Donella Meadows, and Balaton group members from China, Africa, India, and Russia all ask: Do scenarios clarify the handwriting on the horizon, cultivate foresight, and create stories to pretest important decisions? If done with heart and aplomb, scenarios can help groups navigate between denial and fantasy, despair and solipsism, cynicism and airhead wishing. At their best, scenarios create a sense of freedom and possibility, a species of bravery to think the unthinkable (in the adopted phrase of Herman Kahn). And to move us all to more effective actions.

We are honored to have such fine writers and to be the first magazine to cover this waterfront—from corporate to grassroots decision-making; from the business organizational models to the empowered heart; from transnational futures to the future of one’s own life. —PW



# DOING SCENARIOS

by Art Kleiner

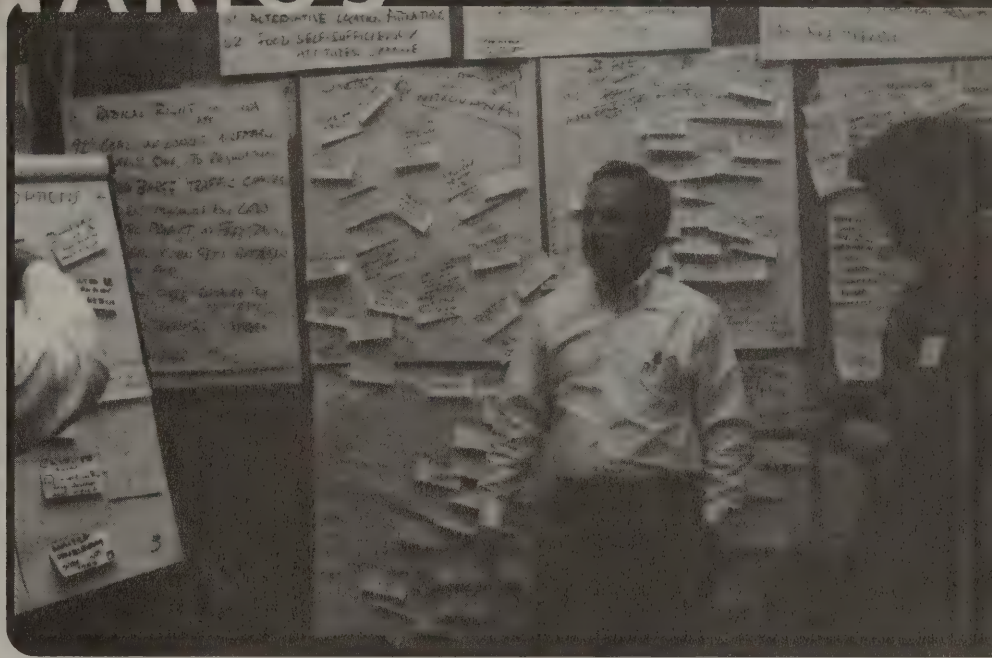
**S**cenarios are imaginative pictures of potential futures, but the future they picture is just a means to an end. These conversations, at once free-flowing and rigorously constrained, are designed to help a group of people trick themselves to see past their own blind spots. Herman Kahn, one of the founding innovators of the practice, developed scenarios to see past the cultural blind spot that thermonuclear war must never happen. What if it did happen? asked Kahn. What sort of world might the survivors face? One dismayed critic, Gerard Piel of *Scientific American*, coined the phrase “thinking the unthinkable” to describe Kahn’s approach, but Kahn gleefully embraced the phrase. Thinking the unthinkable, he argued, was the only way to keep one’s strategic vision from getting stale.

Pierre Wack refined Kahn’s methods at Royal Dutch/Shell in the 1970s and early 1980s. He used to talk of future study as an analogue to Zen archery, a way to hone your senses until you can see the world as it really is, not as you would like it to be. Scenario planning forces us—not just corporate people, but activists, artists, nonprofit staffers, and just about anyone—to learn to visualize the possible worlds in which the unimaginable, the unthinkable, the ungodly, and the unpredictable actually come to pass. If we can imagine such worlds we can partially prepare ourselves for whatever future does come to pass.

Confronting the future with rigor tends to leave most people energized and enthusiastic about facing their future—even if the future looks grim. The steps, methods, and “scenario lingo” are easy to learn and use (sometimes deceptively so); they’re practically jargon-free, especially by the standards of usual management practice.

The practice is, however, time-consuming. People often want to condense scenario work to a half-day or weekend, but it’s becoming clear that such efforts usually don’t give people enough time to delve past their preconceptions. At Royal Dutch/Shell, Wack’s group took almost a year to develop each set of scenarios. In contemporary

GLOBAL BUSINESS NETWORK



business, about five or six full-time days seems necessary, ideally spread over a three-month period to allow time in between for research and reflection.

The practice of constructing stories of the future has no single method and dozens of techniques. The French, *comme toujours*, follow a very different path. Science fiction writers have been very effective in exploring future utopias and dystopias. Kees van der Heijden has identified several general types: project-specific scenarios (What’s the best way to outcompete a rival or clean a polluted river?); crisis scenarios (How can local, independent bookstores survive in the face of Amazon.com?); exploration/consensus-building scenarios (What are the possible futures for Colombia as a nation? How can we build democratic institutions in South Africa? How can American elections become free of financial influence?).

## 1. THE SCENARIO QUESTION

Scenarios only provoke genuine learning and strategies when they answer genuine concerns. If they are not responding to a specific crisis, figuring out the key question or issues is a crucial step. If the group doesn’t care about the question they’re trying to answer, the rest of the exercise is a waste of time. In the class I teach, with twenty people in the room, I generally spend at least three or four hours on this step. Sometimes you can “jump-start” this process by interviewing people ahead of

A typical scenario workshop polls participants on a question about certainties and uncertainties. Then the facilitator clusters responses to see how much consensus occurs.

### Delphi Technique

To determine how uncertain a driving force might be, especially when data are scarce, scenario builders can poll experts ("seek the oracle at Delphi"). They ask the experts anonymously to indicate the probability of something happening by a specified year. For instance, "What is the probability that windmills will generate 10 percent of all electricity in Asia by 2020?" Or, "What is the probability that the Florida manatee will go extinct in twenty years?" The answers are divided into four ranks (e.g., manatee will go extinct in ten, twenty, or fifty years, or "not an issue") and sent back to the experts, who must justify the quartile they choose. Their reasons are compiled and recirculated with a request that the experts note omissions or mistakes in positions different from theirs. Finally, the scenario builders circulate the new information and ask everyone to provide a new estimate.



### History or Precursor Analysis

This is heart of the "story" in history. Can history teach us anything? Can the 1929 crash tell us anything about today's financial crises? Can the rise and fall of other powerful nations tell us anything about the future of the US? Does the acceptance of the railroad, telegraph, radio, and TV mean that humans can't resist new telecommunications technologies? Does the possible slaughter of giant sloths by Pleistocene hunters tell us anything about the future of elephants? Is what the wealthy eat, drink, and do today what the middle class will do tomorrow? After building scenarios, "testing" them by reviewing similar moments in history can add richness, complexity, and understanding to final strategies.

time: if they could answer one or two real questions about the future or could reach a decision on one or two issues confronting their organization, what would they ask?

Part of this stage involves picking a year from which the scenarios will look back. How long a time frame do we care about? Scenarios for next year may be so close to current reality that they may not reveal much; scenarios for twenty years out may embody so many "wild card" possibilities that it's difficult to care about them, though some corporations like Shell try scenarios for sixty-year futures.

## 2. THE PROXIMATE ENVIRONMENT

The group usually tries to depict the environment in which the decision will be made. Sometimes called key factors, this is the group's internal nitty-gritty. It is not the big picture. It's about the starting line, the micro-picture of the familiar and close, not how participants may think after the scenario process. Participants ask: What in the local environment seems well-defined? How do we define success or failure? How do

we make decisions? Is the process structured so that our decision can have an influence? One technique uses giant Post-its on which everyone writes two or three ideas and sticks them on a wall. The Post-it technique can be revealing. Many times participants discover that they see their environment with completely different worldviews.

In some more focused or crisis scenarios, it is also important to reflect on who you are. The crucial question to ask is: What are the organization's distinctive competencies? These might include brand name (Sierra Club or Nike), patents, knowledge of customers

or citizens you want to serve, charismatic leadership, or access to power. Without consensus on what you are good at and what gaps exist in your abilities, thinking about the future can drift into group fantasy or cheerleading.

## 3. DRIVING FORCES

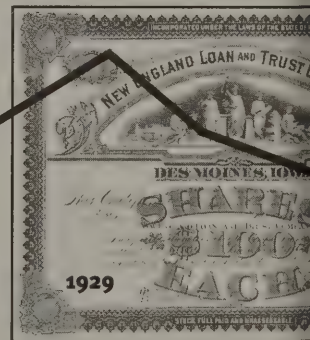
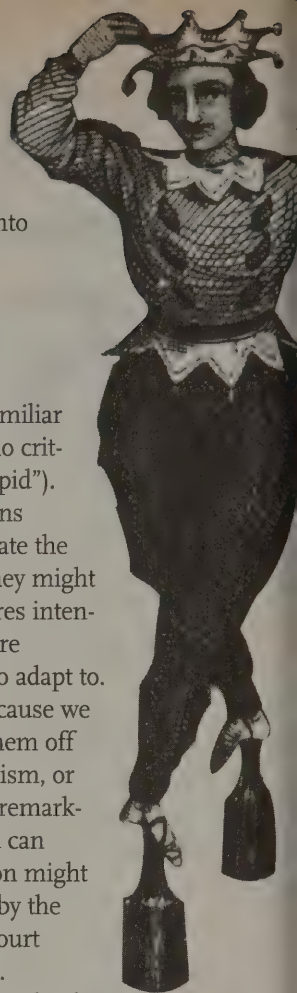
My classes next list as many potential driving forces as we can. We follow the familiar "brainstorming" principle of permitting no critical, deflating comments (e.g., "That's stupid"). We downplay our feelings and assumptions about the forces—how much we like or hate the implications, or how probable we think they might be. Drawing up the preliminary list requires intensive give and take. These are the big picture forces—the "macro," the forces we have to adapt to. We can miss the crucial driving forces because we deny them to ourselves, wishfully think them off the screen, suffer from pessimism, optimism, or ignorance. Sometimes it helps to have a "remarkable person" who is "outside the box" and can suggest driving forces that the organization might not see. The remarkable person, selected by the scenario facilitators, can act as a kind of court jester, popping the bubbles of groupthink.

Usually, after everyone has groaned, applauded, or remained silent over all the suggestions, we cluster them into as few categories as possible. Someone might have said "birth rates," while another suggested "the aging population." We could lump them together as the "demographic driving force." An animated conversation usually occurs over when to lump. This polling/clustering technique can become a dramatic experience of collective learning.

## 4. JUDGING IMPORTANCE AND UNCERTAINTY

For each driving force, we ask three questions: Is it predetermined (unchanging)? How uncertain are we about our ability to predict its importance into the future? Is this particular driving force among the most important drivers of the future — will it make a difference that makes a difference?

Predetermined forces will play the role of fates in the final scenarios. They are unchangeable destinies. In short, they must be predictable within the time frame of the scenario. For instance, we know, barring unforeseen calamity, how many twenty-year-olds will exist in any country nineteen years



from now. What they will think and want may be unpredictable and uncertain. We might guess, and we even might strongly feel, that some outcomes are probable, but we can't be sure. Most forces are similarly uncertain. We can't predict them, but, as we design scenarios from these uncertainties and predetermined forces, we can become far more aware of why events might move in one direction or another.

Sometimes many bouts of between-session research are needed. After study, a "predetermined" element may emerge as quite flexible or a critical uncertainty may appear unexpectedly firm. In the end, we may have only a handful of elements that everyone accepts as predetermined, but they will be powerful; they set the boundaries for the scenarios.

Finally, a sidebar of "wildcards" should be kept. These are somewhat off-the-wall possibilities that a few participants feel could actually happen. A Green-based religious movement or global climate cooling or the opening of borders to the free movement of labor might all be considered wildcards. They hover about, tantalizing the scenario plots.

## 5. COMPOSING THE STORIES

At this point, typically, we have papered the room walls with scribbled notes about potential eventualities, and a wave of anxiety and gloom overtakes us. It looks as if we'll never get anywhere. At this stage, the skills, imagination and openness of the facilitators, participants, and "remarkable person(s)" are tested. It might be time for more research, lunch, or the first attempts to create distinctive stories from the driving forces and critical uncertainties. A major rule: check continually to make sure that none of these stories are redundant with each other—that they truly represent different ways that the future might unfold. Another rule: reduce the number of scenarios to three or four. Five is usually too many.

Critical uncertainties can be displayed along a spectrum (one axis) or a matrix (two axes) or a volume (three axes). This approach, though used by most scenario consultants, has always seemed too formulaic to me. Except in very skilled hands, it can lead to highly conventional futures that don't offer anything.

Peter Schwartz, in *The Art of the Long View*, suggests a different approach. Look for archetypal plots and fit the driving forces to them. Scenarios might be "Winners and Losers," "Victims Become Heroes," or "Persecutors Prevail," or maybe Arnold Toynbee's idea of "Challenge and

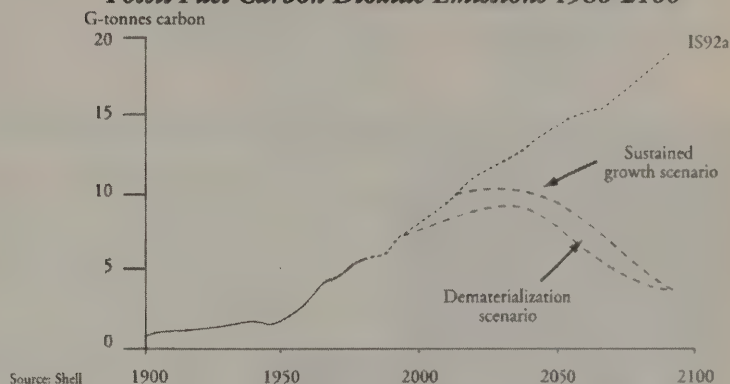
Response," in which civilizations (and the organizations within them) grow stronger by learning to deal with the crises confronting them. I like this approach in principle, but I personally find it difficult to facilitate. Some people take the idea of "winners and losers" too literally; they get straitjacketed by the archetypes, instead of using them as springboards for fresh thinking.

### Trend Analysis

Trend analysis is the commonest tool of futurists. It involves drawing a line up to the present moment and then extending it into optimistic, business-as-usual, and pessimistic futures. The method is laden with difficulties: the trend could break from a "wildcard" event or an unforeseen change in the total system. Trend analysis frequently doesn't pan out because of incomplete data and wrong feedback loops.

### Shell Scenarios:

#### Fossil Fuel Carbon Dioxide Emissions 1980-2100



FROM SCENARIO PLANNING (SEE REVIEW, P. 88).

I favor a third approach. I give everyone three votes for the "critical uncertainties" that seem farthest "upstream" to them (the three that influence the most other factors). When we tally those votes, we end up with a short list of highly influential factors. Then we imagine them pushed to the furthest plausible extreme. The difficulty with this approach is that majority votes do not always capture the most imaginative and relevant futures.

### Cross-Impact Analysis

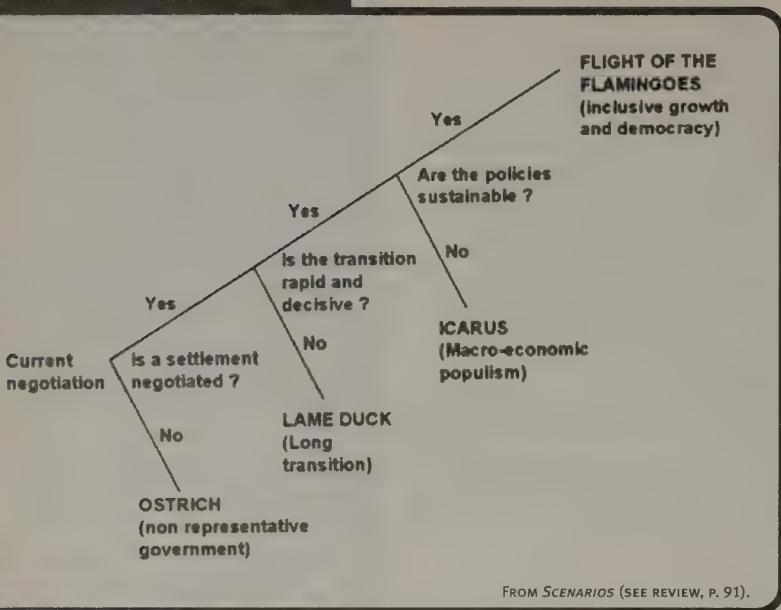
This is simply an elaborate matrix drawn to highlight factors that might be very relevant or irrelevant to thinking about the future. These matrices can be very elaborate. They are commonly part of the scenario logistics stage. Planners pair each driving force or indicator with another. Marking a box "+" means that they help each other; "++" that they force each other in the same direction; "-" that they hinder each other; "--" that they block each other; "o" that they are disconnected from each other.

FROM SCENARIOS (SEE REVIEW, P. 91).

	Government	Pressure groups	Employees	Fin. Markets	Customers
Withdraw	--	++	---		-
Continue as is					
Short-term investments		-	+	+	
Long-term investments	+	--	++	-	+

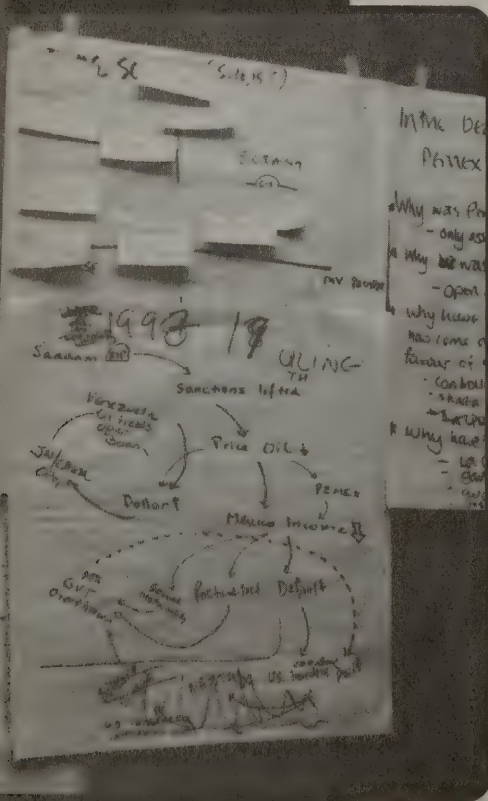
### Remarkable Person

Sometimes a scenario facilitator will invite an outsider to the group. The outsider could have a special knowledge or know nothing but have a specially desired imagination. The "remarkable person" can open the group's imagination, acting as a court jester or guru.



**Branching or Decision-Trees**

One scenario tool says: What if? Then what? Here are the Mont Fleur scenarios (p. 89) in decision-tree format.



**Modeling, Simulations, Influence Diagrams**

The chart shows a typical scenario tool—an influence diagram with strong and weak arrows. Modeling and simulations are elaborate influence diagrams.

This crucial moment in the scenario process is successful when the stories are truly vivid and different, they can be told easily, and they capture the dynamics of the futurist

worlds. What will you call each one? We want a pungent, catchy name that is both soundbite-snappy and soulfully deep, to provide a resonant handle that can enter into our common vocabulary. A scenario of great vision and belief in technology might be humorously entitled "Titanic," as opposed to a great vision but low-tech scenario called "Kon Tiki."

**6. SUB-GROUPS AND REALITY CHECKS**

Except for exploratory scenarios, the ultimate step in the process will be one or more strategic decisions.

Therefore, it's important to do a reality check, to insure that these stories aren't just true-romance novels or science fiction. Reality checks are often done by smaller groups. They always

ask: Is the internal plot logical? Can we really get from point A in the plot to point B, C, D, or E? What plausible chain of events, actions, and counterreactions could lead to this future? What kind of economy is consistent with this scenario? What political reactions would have to take place to make it plausible? Is there a techno-fix on the horizon? Kees van der Heijden calls the step "wind-tunneling," referring to trying out a new airplane wing in a wind tunnel before letting it take off in the sky.

Reality checks for scenarios require a multitude of testing techniques: the Delphi technique; modeling; simulations that result in "influence diagrams"; decision-trees or branches that say, "If this does or doesn't happen, then what?"; cross-impact analysis; trend analysis with special attention to potential breaks in the trend; and historic (a.k.a. precursor) analysis, which looks to similar moments and trends in history (see sidebars).

Some teams rehearse the scenarios as if they were pieces of improvisational theater, each participant taking the part of a different key actor or driving force. A rule: Track down the most surprising elements. Don't dismiss them as too improbable. Thinking the unthinkable may be the most rational thought.

You may find that your scenarios go through several iterations, as you get closer to the "heart of the lesson" in each. At the core of each one is a message your group is trying to tell itself, an insight that you are trying to see collectively, valuable precisely because it is so hard to see. You are never done, but you will have created a language to voice these hard-to-come-by insights.

**7. IMPLICATIONS**

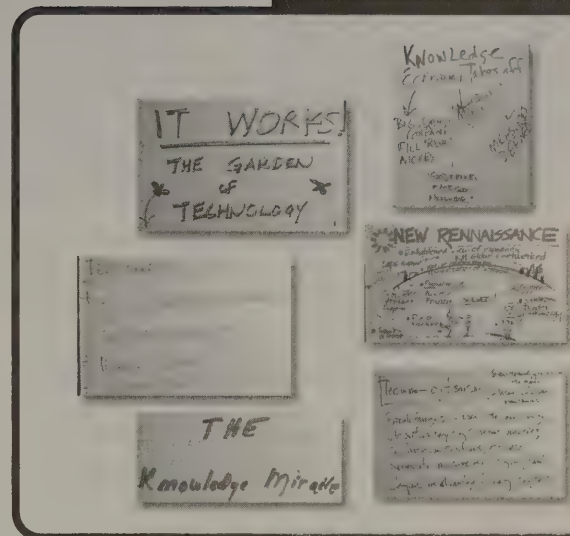
Regrettably, many scenario exercises stop here. But the real work that yields real benefits is just beginning.

We must now return to the original issue, question, or decision/dilemma, and their key factors. What would our decision look like in those worlds? How do the scenarios affect the people we care about? How are we most vulnerable in each scenario? Will our present decision-making apparatus work in all scenarios? How could we adapt to each scenario or be prepared if we see one of them coming? How fast could the organization change to meet the scenario's challenge? What do they suggest about our current strategies—are we setting ourselves up for a rude awakening? If each world came to pass, what would we want to have been thinking about ahead of time?

## 8. STRATEGIC VISIONS AND ORACLES

We have set the scenarios up as competing oracles. It is important to know which oracle is closest to the actual course of history as it actually unfolds. For corporations, this is the stage to select indicators that will advise the company that one of the three or four scenarios seems to be the path chosen by the world itself. It's time for to develop an early-warning apparatus to allow the company to switch faster (the competitive advantage), join with another firm (symbiotic advantage), or take other action to survive longer and better. Those concerned with a sustainable world have yet to find the best indicators, but look for weather vanes in the shapes of endangered species, numbers of educated children, or level of equitable nutrition.

Finally, I ask a question that is not necessarily part of scenarios that try to adapt to changing environments or focus on profit and survival. I ask: "What kind of world do I want to help create?" Some of the scenarios might represent warnings—futures that can be avoided if you take the appropriate steps now. Others might represent some kind of high road, an "unattainable" ideal that you now realize is indeed attainable, because the scenario has shown you how to look for the leverage you need. ☺



Art Kleiner is a long-time contributor and editor at Whole Earth, a teacher at New York University, author of *The Age of Heretics* (Doubleday, 1996), a well-known helper to others having trouble writing their own books, and a member of GBN.

### Polls and surveys (cluster diagram)

The Post-it is a useful tool in polling scenario participants. Everyone answers a question, then posts the answers in similar clusters.

### Global Business Network

[www.gbn.org](http://www.gbn.org)

The Global Business Network is a for-profit organization with membership corporations (\$35,000) and a wide-ranging, eclectic network membership. The leading group in exploring and promoting scenarios, GBN's consultancies, workshops, dinners, talks, webwork, and myriad events attempt to ferret out the crucial global driving forces and hidden uncertainties.

GBN's website is the best one-stop introduction, with descriptions of scenarios including Mont Fleur and Destino Colombia; essays by Peter Schwartz, Kees van der Heijden, and others; book reviews; and bibliographies. While you're at the website, check out the archive of Stewart Brand's reviews for the GBN Book Club. SB became a GBN founder

### The Centre for Generative Leadership

[www.cgl-leadership.com](http://www.cgl-leadership.com)

A Massachusetts consulting firm that works with companies on emergent strategy formation and generative leadership development. Adam Kahane and Joseph Jaworski (see "Changing the Winds," p. 82) are partners at CGL.

### The Futurist

\$35/yr (10 issues) with membership in World Future Society, 7910 Woodmont Ave., Suite 450, Bethesda, MD 20814, 800/989-8274, 301/656-8274, fax 301/951-0394, [echard@wfs.org](mailto:echard@wfs.org), [www.wfs.org](http://www.wfs.org).

The popular magazine of futurists. Precognition gurus galore plus new gadgets.

### Future Survey

\$79/yr (12 issues). From World Future Society (see above).

Very thoughtful summary of best books and articles on all aspects of the future. A crucial resource.

DANCEABILITY PERFORMANCE PIECE. PHOTO: GIL GROSSI.



### The Macmillan Atlas of the Future

Ian Pearson, ed. 1998; 128 pp. \$17.95. Macmillan.

The only atlas looking ahead to the environment, resources, technology, globalization, and state of humanity in 2050 and beyond.

### Dramas and Games

Dramas and games can bring scenarios to life. Is there equity between the roller-skater and those traveling more slowly in wheelchairs?

# CHANGING THE WINDS

## *Scenarios for People Who Want to Change the World*

**E**ach of us has a choice to make about how we look at the future. Will we be most effective by trying to adapt to what is happening in the world around us? Or by choosing to participate in shaping the future?

Looking back on my career, I can see that I have been working on these questions for the past fifteen years, in large companies around the world and in public projects in Canada, South Africa, Colombia, and elsewhere. This work reminds me of Joseph Campbell's circular "hero's journey," the stages that all of us—not just great mythic characters—meet on the way to finding our life's work: the call to adventure, crossing the threshold, the road of trials, the supreme ordeal, and the return and gift.

So far, four lessons about strategy have stayed with me from my experiences in the cauldron of public conflict.

### *1. The Man with the Answers*

I grew up in Montreal in a family which believed in working to make the world a better place (the emphasis was more on thinking and doing than on feeling and being). I studied physics at McGill University. In 1981 I went to a conference in Calgary organized by Pugwash, an organization of scientists striving to prevent nuclear war. I found it very inspiring, particularly a woman from Sri Lanka who spoke of energy as a more pressing challenge to developing countries than nuclear weapons. I met John Holdren, who invited me to pursue a graduate degree in energy economics. I arrived at the University of California, Berkeley, in 1982, eager to learn how to use policy to help the world. Professor Holdren taught a course, "Tricks of the Trade," about influencing the world. What I took away from this course was that the main thing was to produce the right answer quickly, so that when testifying before a Senate committee (which we all aspired to do), we could say, "Well, Senator, that's a good question, and I think that the right answer would be exactly 3.2 terajoules, and that's why you should support this legislation."

After graduating, I joined Pacific Gas and Electric. I learned more of the same. You became a star by having quick answers to your boss's questions: "Well, boss, I think the rate of return on this

project would be 15.2 percent and that we should go for it." Then I was recruited to work at Royal Dutch/Shell in Group Planning Coordination in London, eventually to head up the social-political-economic-technological scenario team. For somebody interested in strategy work, this was the pinnacle. By this time, I was very analytical in my approach, with a lot of knowledge about the energy industry; that's why I was hired. But I had lost most of my interest in changing the world. I was dispassionate, even cynical. At the same time, I loved the Shell environment. I found the people incredibly smart and knowledgeable. If they were arrogant it was because they were the best. I admired them and was proud to be one of them.

I learned the scenario method there. My teacher was Group Planner Kees van der Heijden, who taught me that the purpose of scenario planning was to observe the world and help the organization adapt to it. Talking from idealism, about outcomes we wanted, was not only improper, but dangerous. It led people into trouble; thinking about their desired futures, they might act outside their proper domain or miss important signals that didn't fit with their desires. It was critical to differentiate clearly what you could and could not influence. As Kees says, "If you're in a hang glider, then you have options as to how you lean and distribute your weight. But you only have scenarios for the direction of the wind. If you start talking about options for wind direction, as if your wishes about wind direction could influence it, you will get terribly hurt."

I was not completely happy with this approach. It implied that Shell, one of the largest corporations in the world, didn't and shouldn't have much influence on the world. Shell's leaders and planners thought that it would be improper and irresponsible—not our job—to exert influence outside a closely-circumscribed domain. Except in matters that directly affected the business, our task was to observe and adapt.

This realistic, adaptive paradigm dominates thinking about corporations and corporate strategy. Philosophically, it corresponds to objectivism and representationalism, where we assume that there is a given world out there that we can study. The danger I saw was that it could end up being reactive and

I met Adam at a scenarios workshop for the United Nations Development Programme. He was the gentle guide, I was the somewhat brash court jester. He mentioned that we might like a talk he once improvised at the Global Business Network. A slightly different version will appear in *The Dance of Change*, by Peter Senge, et al (to be published this spring by Doubleday). —PW

by  
Adam  
Kahane



irresponsible. But I also saw problems with its opposite, the idealistic pole, where we assume that we can create the world we want. Philosophically this is subjectivism and solipsism—everything is possible, only my interior life exists—and the dangers are myopia and hubris. So I found myself stuck on the horns of a true dilemma.

I wouldn't have said it then, but in retrospect this period corresponds to Joseph Campbell's "the wasteland," a time of living inauthentically. I learned a lot; looking back, though, I see that I did not fit.

When Kees retired from Shell, he was replaced by an outsider, a visionary lawyer and businessman named Joseph Jaworski, who had founded the American Leadership Forum and is now my partner in the Centre for Generative Leadership. Joe caused a ruckus at Group Planning; he wanted the scenario work to be activist, to contribute to shaping a better world. He also believed in the importance and power of a leader's and a company's higher purpose, beyond simply observing, adapting, making money, and surviving. This stance sparked deep disagreements in Group Planning, but it struck a deep chord within me. I found my energy, which had been sapped, coming back. Campbell calls this "the call to adventure." You hear a call, you don't know what it is, and you don't even recognize it as a call.

In 1991, Shell was invited to send a staff member to South Africa to facilitate a series of workshops being organized by Professor Pieter le Roux at a conference center near Cape Town called Mont Fleur. The project (see box, p. 85) was an attempt to use the Shell scenario method to improve strategic thinking and conversation among South African leaders about the future of their country.

South Africa had just begun the transition from apartheid to a democratic government. It was only a year since Nelson Mandela had been released from prison and the left-wing opposition legalized; the first all-race elections would not be held for two more years. It was a period of many activities where people who had been in deep conflict were getting together to search collaboratively for a way forward.

Scenarios were already well known in South Africa because during the 1980s a scenario exercise

led by Clem Sunter, a senior executive at the Anglo American mining corporation, had played an influential, public role in building discussion, particularly among the white population, about possibilities and options. But the Anglo American scenarios, for all their insights, fell short of their potential because they were developed by a fairly homogeneous team and in effect handed to the country as a set of answers.

The Mont Fleur scenarios were different. The multiracial scenario team included twenty-two members from across the spectrum of South



## Shell

*Because of the time scale on which oil companies worked, even six years was too short a time for planning. In 1967, a study set up to look at Shell's position to the year 2000 showed that the predictable, surprise-free environment would not continue, and that a shift in power from the oil companies to the oil producers in the Middle East could create major increases in the oil price. Accordingly, an exercise was carried out from 1969 to 1970 called Horizon Year Planning, in which a dozen of the largest Shell Oil Companies around the world, as well as executives in areas such as marketing and production, were asked to look forward to 1985.*

*The oil price had been based on seemingly predictable factors of demand and supply since the Second World War. Both were assumed to be predetermined. Ted Newland said, "Having developed this scenario, the problem was how to get into Shell's corporate culture the idea that it had a blind side. I still did not have a track record which would let us challenge or confront that culture directly. So we produced a set of absolutely impersonal, mechanical scenarios about the future of oil prices. One of them was the general perception of the corporation, that prices would remain as they were. One expressed the idea—our feeling, but not presented as such—that oil prices would rise. Even this dispassionate presentation of the idea had a traumatic effect."*

*The effect of this on corporate planning, based on sets of key numbers which had described the business over the past years, was to look for ways of including the effects of uncertainty. Once the Yom Kippur war broke out in the Middle East, the oil embargo by producing countries did indeed lead to a sharp increase in oil prices with the inevitable depressing results on the world economy, changes in supply lines, and changes in behaviour and attitudes. Shell's ability to act quickly has been credited with moving the company into the lead in the oil industry. —GILL RINGLAND, SCENARIO PLANNING (SEE P. 88)*

*I was much more effective when I gave up the stance of knowing and arrogance and replaced it with one of wonder and reverence.*

Africa's diverse constituencies: community activists, conservative politicians, African National Congress officials, trade unionists, mainstream economists, and senior corporate executives. Our objective was to develop a set of alternative stories about South Africa's future, to provoke debate and forward movement.

One Mont Fleur scenario ("Lame Duck") envisioned a prolonged transition with a constitutionally weakened transitional government. Because the government "purports to respond to all, but satisfies none," investors hold back, and growth and development languish amidst a mood of long, slow uncertainty. This was an important scenario because a coalition government was

being negotiated, and the scenario allowed people to see potential dangers and how to mitigate them. Another scenario ("Icarus") suggested that a black government could come to power on a wave of public support, embark on a huge, unsustainable public spending program, and consequently crash the economy. For the first time, a team including prominent left-wing economists discussed the possibility of a new government trying to do too much.

The Mont Fleur project contributed to the building of a common language for talking across groups about the opportunities and challenges facing the country. This shared understanding—together with the fruits of constant other workshops, meetings, and negotiations—eventually helped lead to the unprecedented "miraculous" transition from minority to majority rule in 1994. One specific Mont Fleur contribution was creating a more realistic assessment of the crucial economic dimension of the transition; previously, most people had focused only on political, military and constitutional aspects.

Personally, I was overwhelmed by this experience. I liked the South Africans. I found them warm and I admired their extraordinary capacity to listen to each other. I respected the sacrifices that the people I was meeting had made to bring their country to this juncture. At the same time, I was struck by my own effectiveness as a facilitator. In fact, I was more effective in the Mont Fleur project than I had ever been before—and than I would be again for many years. I had done something right, but I didn't know what it was.

Eventually I figured it out. At Mont Fleur, I had had almost no time to prepare. With more time, I would have done my normal PG&E or Shell thing. I would have read, formed opinions, and brought a recommendation. I was effective because I arrived

in ignorance and respect. One of the participants, Howard Gabriels, said afterwards, "Adam, we couldn't believe anyone could be as ignorant as you. We were sure that you were trying to manipulate us. But when we realized you really didn't know anything and were really there just to support us, we decided to trust you."

This was my first lesson: I was much more effective when I gave up the stance of knowing and arrogance and replaced it with one of wonder and reverence. This allowed me to enter into what philosopher Martin Buber calls an "I-Thou" relationship with the rest of the group. Such relationships are the source of generativity.

## *2. The Messy Gray Zone*

Mont Fleur was the start of a series of love affairs for me. I fell in love with the country, with this new "servant consulting" work, and with Dorothy, the project coordinator, whom I ended up marrying. I resigned from Shell, moved to South Africa, and started to work internationally as a strategy consultant to both private companies and public institutions. In Campbell's terms, this was "crossing the threshold" into another world.

I wondered for a long time whether the Mont Fleur scenarios were actually scenarios in the way I had been taught to use the term. Were they stories responding to outside events, like the Shell scenarios, or were they, in fact, options that people might choose? Kees van der Heijden convinced me that, technically speaking, the Mont Fleur scenarios were Shell-style adaptive scenarios. None of the participants had the option of choosing South Africa's future. They could only choose options for themselves based on an understanding of events around them. On the other hand, in the years that followed I could see influential South Africans using the scenarios, not only as a guide for their own choices, but as a way to talk through and influence their country's destiny.

I also wondered about a comment made by Rob Davies, a member of the team. "The exercise was very good," he said. "But I felt that I had to compromise." Why, I wondered, did he feel dissatisfied?

Campbell talks about the hero's "road of trials," in which valuable knowledge may be forgotten. In fact, I forgot the first lesson almost immediately. My old arrogance came back, my learning slowed down, and I began to consider myself the North's gift to South Africa. In 1994, I organized a meeting in Berkeley with Steve Rosell, Don Michael, and Ed Schein—all highly respected theorists on collaborative learning. I wanted them to tell me how to make these projects work. It was a terrible meeting. Eventually, Ed said, "You know, Adam, your approach is foolish. You are living in the world's



greatest laboratory of collaborative futures and you're asking us what to do." I had reached the nadir of my "knowing," not able to see what was in front of my nose.

I was working at the time with Kees van der Heijden on a scenario project with Steve Rosell for the Canadian government. Like most state organizations, the Canadian government had never done scenario work. Why do scenarios when you control the fate of the country and can simply choose the future you want? But when Kees and I got there, this assumption of control was being questioned. "We have these levers that as civil servants we've been trained to use," one of them told us, "but the levers don't seem to be connected to anything any more."

Meanwhile, I was working in South Africa with various collaborative "forums" composed of businesses, government, opposition parties, trade unions, and community organizations, trying to find a way to reshape the country's institutions. People in the forums joked that there was both "a practical and a miraculous solution. The practical solution is that we all get out of our chairs, get down on our knees, and pray for a band of angels to come and solve this problem. The miraculous solution is, we stay here, work together, and find the solution ourselves."

I learned my second lesson from contrasting these two experiences. People seemed much more effective when they gave up the illusion of being in control, and tried instead to work through things with others. When, as with the Canadians, they held onto the need to deal only with things under their control, they weren't effective. They operated in an all-or-nothing, black-or-white, win-or-lose world that didn't reflect the way things really work. The South Africans, by contrast, were daring to play in a gray zone between complete control on the one hand and no influence on the other, a generative domain where they had less control than they wished but more influence than they expected.

### 3. The Dimension of the Heart

I later became involved in a larger scenario project on the future of Canada, in the context of fierce debates over economic and social policy, Québec secession, and other issues. Modeled on Mont Fleur and convened by businessman Michael Adams, these sessions brought together Canadians from across the spectrum: Québécois and Western leaders, businesspeople and trade unionists, community leaders, and aboriginal peoples. The group took a particularly long time to come to consensus; we had to add an extra session. I felt fogged in, unable to see clearly the picture we were trying to create.

The Canadian writer Margaret Atwood has said, "Just because English Canadians don't move their

faces much, doesn't mean we don't have feelings." As a Canadian I certainly had strong feelings about the subjects we were discussing, but I didn't pay much attention to my feelings and certainly didn't articulate them. Most members of the group behaved in the same way. Although the rational arguments often had an emotional edge, peoples' feelings were rarely put on the table. Somehow this slowed things down.

Around the same time, in South Africa, Dorothy Kahane and I facilitated an uplifting strategy session for the Synod of Bishops. Archbishop Desmond Tutu had retired and Winston Ndungane, his successor, wanted to get his thirty-two bishops together to plan for the future of the Anglican Church in South Africa. We knew this

## Mont Fleur Scenarios: South Africa

### OSTRICH

*The de Klerk government "sticks its head in the sand." Some other path than free election occurs. White segregationists and black separatists both gain in influence, stop communicating, and polarize the country. The various parties are eventually forced back to the negotiation table, but under worse social, political, and economic conditions than before, possibly leading to civil war.*

### LAME DUCK

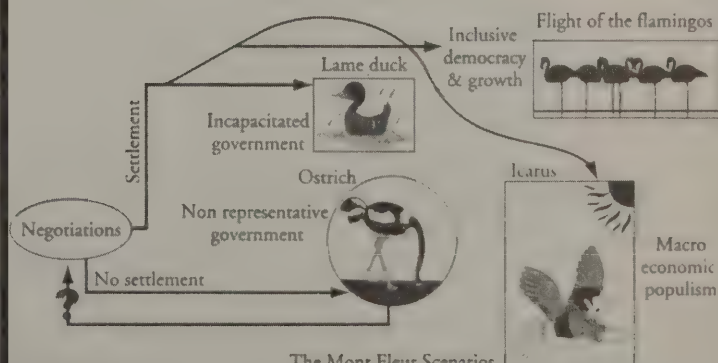
*Prolonged transition with a constitutionally weakened transitional government. Investors hold back, growth and development languish in uncertainty.*

### ICARUS

*A black government comes to power on a wave of public support and tries to satisfy all the promises it made during the campaign. It embarks on a huge, unsustainable public spending program and crashes the economy.*

### FLAMINGOS

*The economy gets no kick-start. There is a long, gradual, participatory improvement, with the country's diverse groups all "flying together" like a flock of flamingos.*



Source: GBN, 1996a

The Mont Fleur Scenarios

SEE ALSO [WWW.GBN.ORG/SCENARIOS/FLEUR](http://WWW.GBN.ORG/SCENARIOS/FLEUR)

*We must give up  
the assumption  
that we are  
powerless, that  
we can only react  
to the world, and  
that we must be  
passive in its face.  
If we have the  
courage to step  
forward, we can  
help the future  
be born.*

would be a very special workshop within the first fifteen minutes, when we were establishing ground rules. Someone suggested, "We must listen to each other." So far, nothing out of the ordinary; that rule is usually suggested. But then a second bishop said, "No, I think we must listen empathetically." A third bishop said, "No, we must listen to the sacred within each of us."

In corporate strategy sessions, we often downplay the spiritual dimension of our work. That wasn't necessary with the bishops. We started and finished each day in church. Although there were many clashes during the workshop, people dealt effectively with difficult and important issues, including some that had been undiscussable for decades.

I learned my third lesson from these experiences. Strategy work is not only work of the mind—the only training I had ever had for it—but work of the heart and spirit as well. Without open acceptance of that heart and spirit, you can have neither true connection nor true passion—the source of commitment and will, and the root of all great strategy.

Now I also had a clue to Rob Davies' concern about compromise. To compromise meant to give in; he had been hoping for a consensus, a true accord. The great social scientist Solomon Asch said that "consensus is valid only to the extent that each adheres to the testimony of his experience and steadfastly maintains his hold on reality." The bishops had the capacity for true consensus because they were able to speak openly about their experiences, invoking more than only their minds.

#### *4. Changing the World*

To Joseph Campbell, the "supreme ordeal" refers to the peak experience on life's journey, after which the hero is never the same. If I have experienced such an event, it was the scenario project I facilitated in Colombia in 1997 at the invitation of businessman Manuel José Carvajal (see box, p. 87).

Colombia had been our metaphor at Shell for everything going wrong. We used to refer to "Colombianization" as the drifting of an economy into a downward spiral of criminality and impoverishment. Now I was going to facilitate a scenario exercise in the middle of a guerrilla war with tens of thousands of people under arms, with one of the world's largest drug trafficking operations, under a

corrupt political and economic system. One of the jokes at the workshop summarized the country's mindset. "In Colombia, the optimists say, 'The way things are going here, we're all going to end up eating shit.' And the pessimists say, 'Yes, and there won't even be enough to go around.'"

At the same time, the forty-four members of the scenario team were wonderfully intelligent, sensitive, and humane. We divided our evenings between earnest debate and loud singing. The team members were far more diverse than the Mont Fleur participants had been. Team members included academics, business people, and trade unionists; rebels and members of the militia who were fighting them; retired army generals and members of environmental groups; peasant community leaders and newspaper owners; representatives of black people, indigenous people, and youth. I think that about a third of the participants had lost immediate members of their families to the conflict that they were discussing: somebody's father had been assassinated, somebody's sister had been kidnapped, somebody's son had been killed. They weren't just observing, they were as intensely engaged as you can imagine.

Technically, it was an almost surrealistically challenging project. One right-wing paramilitary leader had just been released from prison, but all the top leaders of the left-wing guerrillas were in hiding, in prison, or in exile. For the ten days of the workshops, four guerrilla leaders participated via speakerphone. One of them, in exile in Costa Rica, called in from a different phone every workshop. Another one called from a prison pay phone, saying, "I only have a few coins, but I really need to give my input on Scenario 'B.'"

Those people who had suffered most in the war were, in many cases, the most humble, open, and respectful of the others. They were able to listen and suspend judgment, even of their enemies. This reminded me of my first lesson, the importance of wonder and reverence. I had seen the same phenomenon in South Africa. In these terrible, terrible situations, people who are not destroyed by the conflict are purified by it—touched by grace. These Colombians realized that they were in a war that nobody could win, that they had to struggle together to resolve. Every day they lived with the second lesson, the need to move from the illusion of control to the gray zone of influence.

The third lesson was also often with us. These participants had the capacity to speak from the heart, to express their fear, anger, hope, and faith. When they did, the fog in the room lifted and the stark dynamics we were trying to study became clear. One of the most powerful sessions was an evening where participants all told stories from their own lives.

During another workshop I said that I was concerned about some of the participants being mortally afraid of each other. One of the guerrillas responded over the speakerphone: "Why are you surprised at this fear, Mr. Kahane? Of course the fear that pervades Colombia is also in the workshop room."

At the end of 1997, the team meetings ended. Since then the stories have been told and debated throughout the country. One story, "When the Sun Rises We'll See," paints a downward spiral that could ensue if status quo attitudes and strategies continue; the moral of the story, drawing on a well-known Colombian saying, is "the worst thing people can do is do nothing." Another story, "A Bird in the Hand Is Worth Two in the Bush," explores how a compromise could be negotiated between the government and the guerrillas; the moral for this one is "any settlement is better than continuing a bad lawsuit." As of this writing in early 1999, the work has been published as an insert in every Colombian newspaper (one million copies), televised in a one-hour special carried on every Colombian TV station and watched by eight million people, and presented in speeches to over 17,000 people. After many years of paralysis, things are starting to move in the country, with hopeful negotiations beginning between the government and guerrillas. Somehow the scenario process has exemplified—and perhaps contributed to bringing forward—a shift toward a better future.

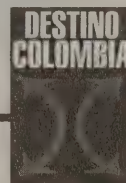
I came back in my mind to my argument with Kees. Were these scenarios, in the ways he and others had defined the term, or were they options? If they were just efforts to develop better ways to cope with outside events, why had there been such a special energy in the workshops? Why had the participants been so passionately engaged? Why had they come at all?

Then the light went on for me. I realized that this project was not really about understanding and adapting. People participated because they wanted to influence and improve the world. They dared to reject cynicism in favor of hope. My colleague Otto Scharmer points out that the team's capacity to sense and influence turns on their being able to tap into their collective passion and will, including by really listening to each other's stories. The fourth lesson from my journey, then, is this: We must give up the assumption that we are powerless, that we can only react to the world, and that we must be passive in its face. If we have the courage to step forward, we can help the future be born.

This fourth lesson also provides the clue to getting off the horns of the realism-idealism dilemma I found at Shell. It is neither true that we must simply react to a world that pre-exists nor that we can create it from within ourselves. The cognitive

scientists Humberto Maturana and Francisco Varela argue that "every act of knowing brings forth the world." More than simply describing the world, scenario stories actually help shape it. The key to evoking this generativity is the deep collaboration, even communion, that arises from being with others in the ways I discovered in the first three lessons. As Maturana and Varela say, "We have only the world that we bring forth with others, and only love helps bring it forth."

Completing Campbell's circular journey, I see these four lessons as a gift from the activists, bishops, guerrillas, and scientists to corporate leaders and other strategists. To be more effective we must first let go of the arrogance of knowing and move towards wonder and reverence. Second, we must move away from the black-and-white, secretive approach of trying to try to keep things "under control," towards the gray zone of greater openness and influence. Third, we must move away from treating strategy and learning as purely affairs of the mind, towards engaging other parts of ourselves, including our hearts and spirits. Finally, we must move away from pure adaptation and reactivity, towards intentionality and generativity. Of course, all of these lessons are easier to articulate than to practice. But I think they offer a prize worth struggling for: the opportunity and the capacity to make the world a better place. ☉



## Destino Colombia Scenarios:

### WHEN THE SUN RISES, WE'LL SEE

*The country collapses in chaos. Lack of will to confront necessary changes leaves Colombians without the ability to act.*

### A BIRD IN THE HAND IS WORTH TWO IN THE BUSH

*After ten years of bloodshed, under continuing pressure from armed groups, the state and society decide to enter into a dialogue and come to serious agreements.*

### FORWARD MARCH!

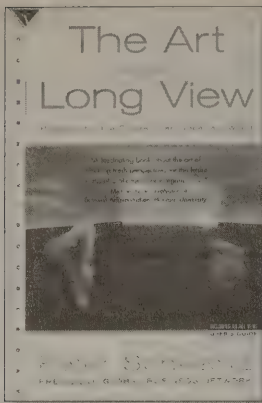
*Colombians elect a government strong enough to impose order and put an end to institutional chaos.*

### IN UNITY LIES STRENGTH

*Beginning at the base of society, Colombians effect a transformation of individual and collective mentality. They give up their old way of life, the inclination to work against each other, and find a solution through respect of differences and the strength of unity.*

SEE ALSO [WWW.GBN.ORG/SCENARIOS/COLOMBIA](http://WWW.GBN.ORG/SCENARIOS/COLOMBIA)





**THE ART OF THE LONG VIEW**  
Planning for the Future in an Uncertain World

Peter Schwartz. 1991; 258 pp. \$15. Doubleday.

Previously reviewed by *Whole Earth*, this is still the preeminent and most valuable introduction to scenario planning. Schwartz co-founded Global Business

Network, the consulting network that has done more than any other to popularize and develop scenario planning in recent years. Before starting GBN, Schwartz developed scenarios at Stanford Research Institute and Royal Dutch/Shell. This book, in my view, is his most lasting contribution, setting out the precepts of scenario practice in such a way

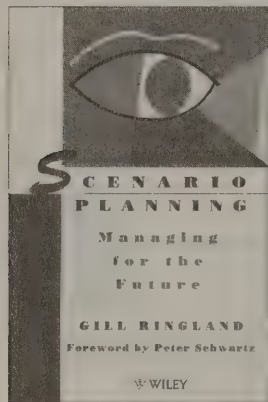
that anyone, from corporate executives to independent *bricoleurs*, can make use of them. —Art Kleiner

If scenario planning is done adroitly, you get an “adaptive strategy” that has some ideas in advance of what you want to be adaptive to. I no longer have to feel guilty about recommending the technique to people that can’t afford a GBN World View Membership [\$35,000/year]. For fifteen bucks they can buy this book. Schwartz’s account is, in part, an anecdotal record of how he built his futurist’s tool kit, inviting the reader to do the same.

For me the great pleasure of taking a constant futurist’s perspective on things is that it forces you to think and notice large, slow, and whole. One gets a sense of one’s time and of what might be interesting to do in it. Then comes an inescapable feeling of responsibility. The more of that the better, I figure. —Stewart Brand (courtesy GBN)

“You can tell when you have good scenarios when they are both plausible and surprising; when they have the power to break old stereotypes; and when the makers assume ownership of them and put them to work. Scenario planning is intensely interesting or it fails.

“One of Shell’s current scenarios is called “the Sustainable World”—a powerful reference to an increasingly popular set of ideas about environmentally sustainable growth. As soon as people start using that name in discussions at Shell, the image comes to life with all its associations. An image of the world in their grandchildren’s time pops into their minds. They can’t help but ask themselves what it really means to be sustainable. The questions that they naturally ask will lead them to the right issues. A good scenario does exactly that—it can lead you to ask better questions.



**SCENARIO PLANNING**  
Managing for the Future

Gill Ringland. 1998; 407 pp. 39.95. John Wiley and Sons.

A confidence-building encyclopedia of scenario projects done to date, in the US, Europe, and South Africa. Ordinarily, there’s nothing so tedious as reading about someone else’s scenarios, and the casual reader must invest a fair amount of reading between the lines to get value from

this book. But Ms. Ringland’s descriptions are cheerfully engaging, and they show how a variety of corporations and nonprofit organizations have used the method. I particularly appreciated the overview of the economists’ scenarios on the future of European Monetary Union, which arguably helped influence the rapid acceptance of the Euro, and Shell’s 1996 scenarios, in which the company’s planners admit that, even in a global boom and oil glut, demand for oil will peak as energy technologies come on line. —AK

“Companies that have used scenario thinking claim results including:

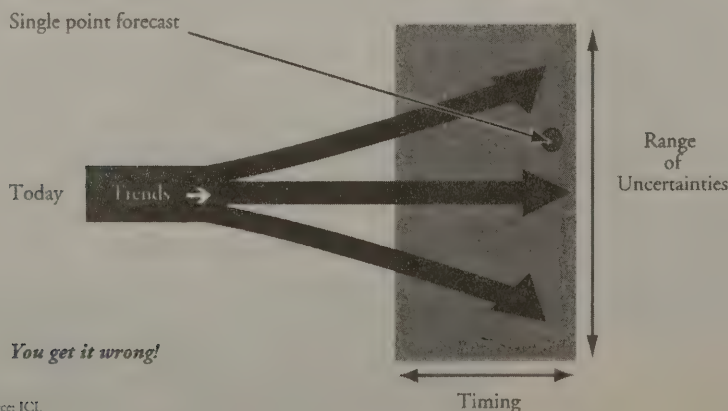
- at the insurance company Erste Allgemeine Versicherung, to spot the results of political changes, e.g., the Berlin Wall coming down and so establish themselves early in former Eastern European countries;
- at Electrolux, the consumer goods company, to see the opportunity for new business, e.g., a service based on re-using consumer products;
- at wiring and cable supplier KRONE, to develop 200 new product ideas;
- at Pacific Gas and Electric, to dispel assumptions about the “Official Future” and cause it to work to reduce energy consumption;
- in the UK National Health Service, to provide a way for a very dispersed, large and disparate organization to think through new relationships, internally and to customers.

**THE FORTUNE SELLERS**  
The Big Business of Buying and Selling Predictions

William A. Sherden. 1998; 308 pp. \$29.95. John Wiley and Sons.

Scenarios are emphatically not predictions. They are ways of coming up with better strategies, no matter what unexpected future comes to pass. That point is driven home in this wonderful book by a financial forecasting consultant. *Fortune Sellers* is a debunking of predictors of all stripes, from stock analysts to Leninists, political savants to economic forecasters, H.G. Wells to the Club of Rome to Faith Popcorn.

Complexity theory suggests that predictors will never be reliable. (This is the only prediction that Sherden permits himself to make, and I guess that it, too, is suspect.) In such a world, moving at ever-more-dizzying speed (but not certain to keep speeding up), we can cope only by learning to build ongoing judgment. Since you already know that, read this book primarily for the pleasure of its debunking. If you’re actually involved in scenario work, read it to keep from going off course. —AK



*You get it wrong!*

Source: ICL

# PIERRE WACK

Pierre Wack (1922–1992) is considered the greatest teacher of scenarios. He guided Shell through the two oil crises. He was a student of Georgy Gurdjieff, a famous teacher of mysticism and the power of Will, and had a guru in India whom he visited each year. His guru called scenarios Wack's yoga of perception and mental activity.

While shunning attempts at clairvoyance, Wack did believe that with specific work and discipline the future could be "seen" to be narrower than "anything goes." Besides teaching all the scenario steps, he insisted that intuition could be the difference that makes a difference. Kees van der Heijden ("The Strategic Conversation," p. 90) talked to him shortly before his death—PW

When I had finished *Scenarios* (see review, p. 91), I was keen to get Pierre Wack's endorsement of it. My publisher sent him an early copy and he responded positively and wrote a nice couple of lines. Then he sent a message that he wanted to see me. At that time he was already quite ill, and could not

move about. I went to see him where he lived in the south of France. He could function only for short periods of time, so our conversation took place in short bursts over a couple of days. Later I pieced together his line of argument.

He liked the book, but he felt something missing. He was quite dismayed with the way scenarios were often being applied, which he saw as cheapening and disabling a potentially powerful thinking tool. He was totally dismissive of the one- or two-workshop approach that had become so popular. He could not see how that could achieve any permanent value. If you set out to acquire new worthwhile insights, you have to allow for lots of time and energy. There are no shortcuts. He thought that good insightful scenario work is an iterative process in which intuitive exploration of the territory (in this case through scenario building) alternates with significant and deep research and analysis of the questions raised by the scenarios. If you don't spend the time and energy needed for good analysis, your scenario work may produce a short "high" which will wear off very quickly and nothing of value will remain.

I go along with his view, although I think we should recognize that the scenario technique can also serve other functions. Even if we cannot overcome all the basic human frailties, it may still be useful to organize a good conversation from time to time, for example to overcome a politically loaded situation. And scenarios really help people to hear each other better. So why not? ☉

The hype about chaos theory has also attracted authors and the media. There have been articles in *Business Week*, *Investing*, and other magazines, hailing chaos theory as a potential savior of the money management industry.... We have come full circle from the pseudoscience of the market technicians to scientific neotechnicians. Both are attempting to do the same thing: find and exploit patterns in historical stock prices. So far, the results seem to be the same. Despite the optimism in the early 1990s, no one has hit a mother lode in their data mining.

I was surprised to learn...that modern weather forecasting is the most successful of all the future-predicting professions.... Meteorology is the only forecasting profession that employs proved laws of nature to make prediction—if only for the very near future. Meteorology is also the only forecasting profession among the fortune sellers that has shown clear signs of improvement.... *Question:* Why did God create economists? *Answer:* In order to make weather forecasters look good.

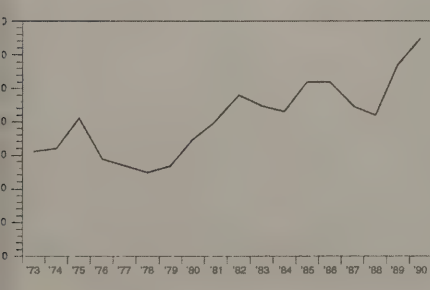
Analysts' earnings forecasts have not improved with experience. Errors in forecasts vs. actual earnings are shown here. By what percent of earnings were the analysts off base? Over 60 percent by 1990.



GBN

“Popcorn claims to have an IQ of 180 (genius starts at 140) and that her predictions are 95 percent accurate. She told the *New Yorker*, “I’m trying to think of a trend I’ve missed—it would be more credible if I thought of one.”...Her most famous prediction is for the trend she dubbed “cocooning” in 1991: “The impulse to go inside when it just gets too tough and scary outside....”

A quick perusal of the 1996 Statistical Abstract of the United States reveals that cocooning is nonsense. The premise that people are hiding out in their homes just is not happening. From 1989 to 1994, eating and drinking places have increased their revenues 25 percent, and amusement parks, recreational facilities, and museums have increased theirs by 61 percent. The number of pleasure trips made per year is up 21 percent. Participation has gone up in sports clubs by 22 percent, at bowling alleys by 5 percent, and at race tracks by 2 percent.



# THE STRATEGIC

## Words of Wisdom from Scenario-Building's Most Erudite Spokesman

**F**orget about ever being able to anticipate everything. You will always have surprises. The best any process can do is to help make an organization more adaptable. That is why I emphasize the scenario process as a powerful intervention in the "strategic conversation," the ongoing process in all organizations that ultimately determines what they will do. The intervention is not to make them see the future, but to make them more flexible in their thinking, make them better observers of the world, and make them better prepared mentally to take appropriate action when events start occurring. That will also help them to act more skillfully if something happens that nobody could have foreseen.

Scenarios serve to help groups to:

- understand a part of the world that is clearly important to them, but that doesn't seem to make much sense at the time, perhaps because they are experiencing a breakdown situation.
- generate new ideas. Groups inevitably develop groupthink. As soon as it sets in, the group can perceive only a relatively small part of the world. If their evolutionary success requires breaking out of that zone, the group may need help from the outside in order to expand into the wider world.
- engage in effective conversation toward reaching accommodation in a state of conflict. I avoid the term "consensus building" because I believe that consensus is rarely achieved. Accommodation comes closer to how people negotiate their way out of problems, but it requires a conversation in which people manage to listen to each other.

If I am shopping for a firm to help me work on scenarios, I am looking for process facilitators who understand what groups can and cannot accomplish, and know how to conduct the process toward a greater chance of success. So my criteria would include:

- Do they listen to the client, and ensure that work focuses on the client's areas of need?
- Do they help people to have a productive conversation, i.e., do they use the power of scenarios to remove conceptual and emotional barriers?
- Do they open up the group's range of vision and lift them out of their thinking box? Do new

ideas emerge? Do they help the groups to think the unthinkable?

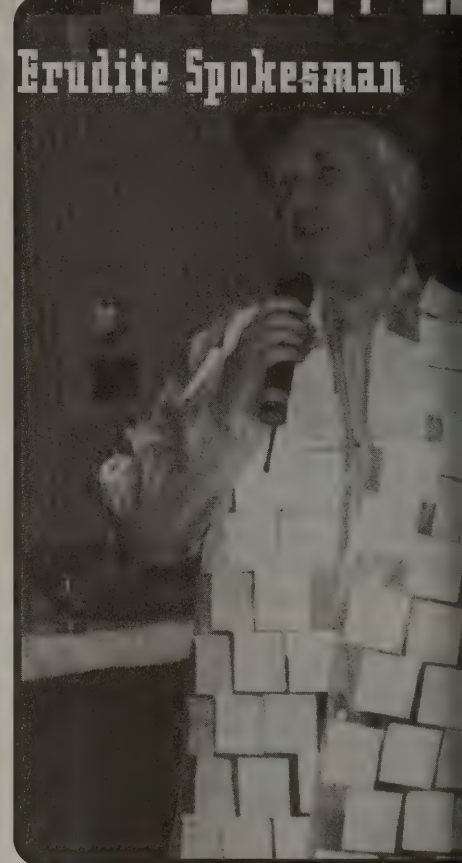
- Do they bring in enough new and relevant insights to help clients overcome confusion and ambiguity?

I would *not* include whether they have a good prediction record. The test of good scenarios is not whether they predict the next currency swing, but whether the organization is better capable of dealing with it when it comes.

### SHELL AND THE ENVIRONMENT

The usefulness of scenarios depends on where you focus attention. And that's determined by where you're experiencing breakdown. The environment, for instance, was always an issue at Shell, if only because the company had to comply with rules and regulations. Early on, the company invested heavily in making its operations more environmentally friendly. I worked in the Pernis refinery in the mid-sixties; attention to the environment was a significant aspect of the operation even then. It was routine, part of day-to-day operations. Top management did not worry about it, they assumed it was being looked after.

What happened in 1989 was that the top management decided that they wanted the average Shell manager to turn from being reactive and become proactive. That was the change, not the awareness of the environment per se. It elevated the environment to a top management issue. Why did it happen then? Although I can't claim to know the minds of the top managers, I know that a number of big issues had recently been on their agenda, especially the removal of lead from gasoline, which had led to real problems for the company. You could say that Shell's top managers had experi-



Kees becomes everyone's opinion. He wears the conversation.

# CONVERSATION

by Kees van der Heijden



GBN

enced a breakdown situation, which grabbed their attention. They decided that they did not want to be where they found themselves; they wanted the company to be on the side of the guys who protect the environment, not those who violate it. That is why they asked me to focus on it in the scenario project.

We had only limited success, as we know now. Turning a company around is not a trivial matter. I don't think the top team at Shell was hindered by denial or a power play. They articulated the

problem and tried to do something about it. But, in hindsight, they didn't manage to penetrate Shell's critical levels. The CEOs had conceptualized the problem for themselves, but we know now that this was not the case for the whole organization. It takes a lot of people to make a company. There are the doers, the guys in the hard hats, who tell you to "get out of the kitchen if you can't stand the heat." You have to reach these people too, before you can argue that "Shell" understands something. We are not all that good yet at reaching the doers with top management's scenarios.

## WHAT CAN GO WRONG

Whole Earth gave me a list by Hermut Bossel (the retired director of the Center for Environmental Systems Research at the University of Kassel, Germany) of things that can go wrong with scenarios: lack of imagination; wishful thinking; denial; ignoring basic driving forces or actors; neglecting physical (ecological), human (e.g., labor or cultural time lags), or systemic constraints; neglecting internal dynamics, feedback loops and indirect or long-term impacts; neglecting or underemphasizing possibilities of self-organization.

This is not a criticism of the scenario process, it is a comment on the human condition. This is how we came to be. All people suffer from these general thinking limitations, with or without scenarios.

Having said that, I believe that properly using the scenario process can help you to overcome at least some of these limitations, particularly in groups. The process has the potential to make a group more imaginative and lift them out of wishful thinking. It can help them discover driving forces and constraints, see feedback loops, and better understand organizing principles. You need to be clear about your goals in this exercise. Do you want to overcome all of Bossel's impediments, or is your objective more limited, such as opening a conversation? That is the first question to answer. ☺

## SCENARIOS The Art of Strategic Conversation

Kees van der Heijden. 1996; 305 pp. \$34.95. John Wiley and Sons.

Corporate managers, with their careers on the line for huge, multi-million dollar investments (like power plants, factories, and drilling platforms), adopted a highly rigid, rationalist, ass-covering form of decision-making called "corporate planning" in the 1950s and 1960s. The 1970s showed that it didn't work. In language that these managers can understand, Shell planner and scenario-

planning mentor Kees van der Heijden shows why it didn't, and presents an alternative: scenarios as vehicles for continually questioning your own assumptions and embracing uncertainty as you go. He also offers valuable and specific scenario-process designs. This book is developing a following in business schools and consulting firms, where it shows highly analytical people how to incorporate into their analyses some of the human values and flexibility that, once upon a time, they felt obliged to jettison. —Art Kleiner

“The distinguishing feature of the scenario culture is that it has invested in assumptions, values and mental models. Tools and techniques are secondary. However sophisticated the tools, if there is no significant effect on assumptions, values and mental models, people will quickly fall back into the old habit of asking, “Tell me what will happen.”

“Apple survived, while Kaypro (how many remember this once well-

known computer manufacturer?) did not. But if you look for some mistake in Kaypro's argument or reasoning versus Apple's, the evolutionary theorists argue you won't find it. You will merely find that some systems have had a random mutation that helped them, whilst others were not so lucky and went under. A strategy textbook written entirely from this perspective would have to come to this conclusion: “Sorry, students, we've studied chaos theory and we have

come to the conclusion that we can't help you.” The evolutionary perspective whilst intellectually appealing cannot be popular with business people. They are not prepared to accept that thinking about the future is done only to satisfy inner needs, to create order in the mind.



# As We Would Run to Meet

## The Heart Behind Scenarios ♥ by Vicki Robin

The main problem with all scenarios is that they're missing the dimension of the human heart, a sense of what makes life worth living. One of our errors is that we haven't yet made sustainable futures seem like fun. We should be running to a desirable future as we would run to meet our lover; we should paint pictures of sustainability full of juice and joy. Sustainable futures aren't happening because people think they're boring.

Well, then, what do you know about a scenario that makes you delighted? How often do you communicate that? How much time do you spend making where we are now look awful, and how much time pointing out the joy of a sustainable future? Where did your passion for this work begin? Tell that as a vivid story. Tell about the time you fell in love with sustainable development.

Then there's the task of proving that there's a plausible bridge from some scenario like global hypermarket to one of regional stewardship; from Viagra to Hugs. How many of us really, really believe there is such a bridge? More likely, we walk around thinking, "Well, Hypermarket will win, we'll have a collapse, it will serve them right. At least, as it all crumbles, I can have the smug satisfaction of knowing I was right." If that's what you believe inside, that's what you wordlessly communicate. People hear your lack of faith more loudly in your demeanor than in any words you speak.

In fact, look around in your daily life: within your family and in your neighborhood, in the actions of the billions of "small folk" rather than in the media-magnified actions of the very few "big folk." *We're already living with the mentality of a sustainable framework. Most of the world is already closer to Regional Stewardships than to Hypermarket.* What's truly implausible is Hypermarket. It has taken enormous determination and expense, and loud

declarations and frantic activity, to keep the pretense of growth alive.

The book I co-authored with Joe Dominguez, *Your Money or Your Life* (Penguin Books 1992), demonstrates that clearly. It has sold hundreds of thousands of copies, has been on the *business* best-seller list for more than two years, and is still selling at 8,500 copies a week—by giving people a personal program to take them directly from a lifestyle entangled in the Hypermarket, across the bridge to Regional Stewardships. It is based on both self-interest and higher values. After people work the program, their expenses go down by an average of 25 percent while their quality of life increases. The program makes people feel smart; it helps them decode the Hypermarket system and free themselves from it. People can see that there is a place called "Enough," and that going beyond that place just leads to clutter. Once you have enough, any further increase in fulfillment comes not from getting, but from giving.

That is the true message. It speaks to people's hearts, and it means the death of Hypermarket! Try this exercise for yourself: ↓

		YES	HAVE	NO
WANT	YES	List what you already have that you are happy with; what you actively use and need.		List your unmet needs; what you don't have but wish you did. Be expansive—include both material and nonmaterial wants.
	NO	List what you have that you wish you didn't have.		List what you don't have and don't want.

If you do this exercise thoroughly, you'll learn a lot about yourself and your life. You'll see that the four spaces in the matrix

THE HUNCHBACK OF NOTRE DAME AND DRACULA FROM THE CINEMA OF ADVENTURE, ROMANCE & TERROR. GEORGE E. TURNER, ED., ASC PRESS, 1989.  
JUST IMAGINE FROM SCIENCE FICTION: THE ILLUSTRATED ENCYCLOPEDIA. JOHN CLUTE, 1995. (SEE PAGE 104)



# Our Lover



## Scenarios for Ways to Meet (or Not) Your Lover:

### Quasimodo and Esmeralda:

The world's unfair. Hopeless faithful love leads to ever-recurring tragic encounters.

**Just Imagine:** Romance forever renewed in a future of mutual flying. **Dracula:** He loves me but it's not good for me/I love her but can't control my cruelty. A necessarily short relationship.



encompass four very basic human feelings. Here they are: Ⓡ

YES

HAVE

NO

**GRATITUDE, HAPPINESS, SATISFACTION.**  
(The failure of the consumer culture is an absence of gratitude amidst plenty.)

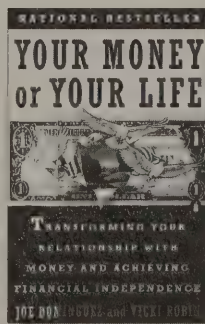
**LONGING, VISION, DISSATISFACTION.**  
(Most things on this list, like peace, are actually **NONMATERIAL** for most people; but photovoltaic collectors or an NGO endowment are part of longing too.)

**SHARING, GENEROSITY.**  
When we recognize what is excess, we can share joyfully...

**FREEDOM.**  
From craving, market manipulation, clutter. Freedom to enjoy life beyond stuff. No more pink flamingoes for the lawn; no more Jet-skis, SUVs, or Coke.

I do shameless marketing of these ideas in the culture of shameless marketing. I say these

things on radio, on TV. They need interesting guests on their programs; why not me? We intellectuals don't like marketing; we think it's demeaning. We try to sell sustainable futures on the basis of their *features* (the whats—solar power, energy efficiency, organic food), not their *benefits* (the whys—gratitude, sharing, freedom, joy, health, real security, and satisfaction). Watch the professional marketers—they *always* point to the benefits (love, beauty, youth, pep, self-esteem) rather than features (fast food, toys, cosmetics). The difference between them and us is that their message is *self-defeating*—and people know it. Ours is *true*—and people don't yet know how to make it part of their daily lives. Ⓡ



### Your Money or Your Life Transforming Your Relationship with Money and Achieving Financial Independence

Joe Dominguez and Vicki Robin.  
1992; 350 pp.  
\$11.95. Penguin.

Vicki Robin is co-founder, with the late Joe Dominguez, of the New Road Map Foundation, an all-volunteer, nonprofit organization that promotes a humane, sustainable future.  
*New Road Map Foundation*  
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Seattle, WA 98115,  
[www.newroadmap.org](http://www.newroadmap.org).

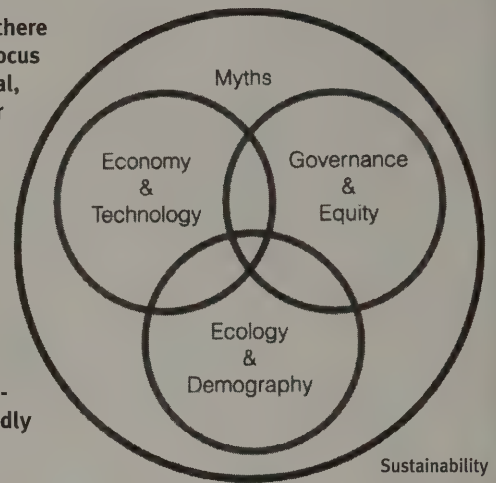
# GREEDY FROGS, BALANCED HUMANS, AND IMPROVISATIONAL MUSIC

The Planetary Scenarios of the World Business Council for Sustainable Development

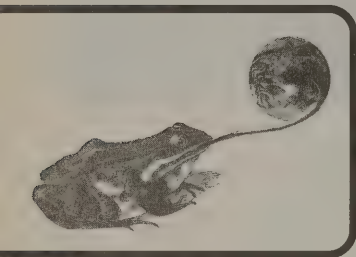
It's very chic to write scenarios for the whole planet. They don't differ too much. Basically, there are "free market futures" and "sustainability futures." Usually, the free market futures focus on global governance or regional trade blocks. The sustainability futures are either global, with a planetary bureaucracy overseeing environmental/human rights standards, or more decentralized, with local and regional governance forming ad hoc coalitions.

We've surveyed most of the whole-Earth scenarios, and landed on the World Business Council's as the most interesting; they included all the players, institutions and organizations. They asked: How resilient is the global system? Then they asked: What human social systems can best respond to the challenge of sustainable development? In their scenarios, consumer activism and pressure from non-governmental organizations; corporate intelligence or stupidity; and phlegmatic or imaginative governments (at all levels) will be the driving forces influencing our children's lives.

Shell International organized these scenarios, so a perk, for those of us who live more simple local lives, is the insight they provide about transnational world views. Ged Davis, brilliant director of the Global Scenarios Project and head of Planning for Shell International, kindly gave us permission to share the scenarios. These are not final stories; Mr. Davis tells us that WBCSD has already revised them. —PW



Sustainability domains: interlocking precepts for the planet's future.



## FROG!

The world of FROG! is a familiar world—at least at first. In this scenario, many nations experience a fair degree of economic success; and for almost all, economic growth is the major concern, with sustainable development acknowledged to be important, but not pressing. Environmentalist NGOs continue to demand enforcement of standards set at global summits, but those nations striving to develop economically argue that, if the

developed nations insist on raising environmental standards, they should "First Raise Our Growth!" Indeed, in this scenario, some nations leapfrog from underdeveloped status to benchmarker in particular areas of technology [e.g., go solar and avoid power lines]. People in western nations respond in uneven ways—sometimes by offering help, and sometimes in raising various cries of "FROG!" themselves, especially in response to perceived threats from underdeveloped nations in the areas of unemployment, copyrights, and patent infringement.

In the FROG! scenario, people value sustainable development—but it is not the top priority. In the early years, environmental health in many areas improves significantly. Improvement in local

air quality, solid waste management, and environmental education leads to a perception that the environment is in much better shape than it was in the late 1990s. But at the global level, the picture is less clear. With economic growth and the increase in population, greenhouse gases are rising, unnoticed by most. The signals are difficult to read, and people disagree about what they mean. Both the difficulty and the disagreement are good reasons, it is felt, to continue to "First Raise Our Growth!" But there is evidence by 2050 that the darkest predictions about global warming are actually nearer to the truth than the more optimistic ones.

In FROG!, the habitual reliance on technology has not been sufficient to solve long-term problems of either environmental or social health. Globalisation and liberalisation of markets, along with the pressures of rapid urbanisation, have raised the degree of social inequity and unrest to a level that threatens basic survival of both human and environmental ecosystems.

In this scenario, people react like the proverbial frog. When placed in boiling water, the frog leaped out of danger; but placed in cold water that was gradually heated to the boiling point, the complacent frog was boiled to death.



"To get rich is glorious"  
— Deng Xiaoping



## GEOpolity

GEOpolity begins with a succession of signals—some real, some imagined—in the first two decades in which an

**"The hallmark of our age is the tension between related aspirations and sluggish institutions"**  
 - John Gardner

environmental and social crisis looms. The prevailing "economic myth" is increasingly viewed as dangerously narrow. This is particularly true in Asia, where rapid economic growth has meant that corners have been cut and traditions lost. Because many institutions, especially governments, have lost credibility as problem solvers, people

expect something from the new centres of power—multinationals. But the business sector seems unable or unwilling to respond adequately. Business is distrusted—and in some cases, because of its prevailing focus on narrow self-interest, it is perceived to be hindering solutions to problems. Its actions are not coordinated on a global level, and it seems to lack the will even to address the problems.

Because neither governments nor businesses are effective in providing leadership, people begin to look for new leaders and to demand new social institutions. Some of these involve the strengthening of government—for example, "sustainable cities," "sustainable national accounting," and comprehensive implementation of industrial ecology. Others are politically innovative. The perceived need for strong and certain responses leads to a new global consensus that welcomes technocratic solutions, sanctions, and more direct control of the market, to ensure that environmental values and social cohesion are preserved. The impetus behind all these movements is the growing consensus that the market has no inherent incentives to protect the commons, social welfare, or any other non-economic values. In the absence of leadership from business and government to solve problems, people form new global



institutions. One such is the Global Ecosystem Organisation (GEO), which has broad powers to design and enforce global standards and measures to protect the environment and preserve society—even if doing so requires economic sacrifice.

In GEOpolity, governments are rejuvenated as focal points of civil society. Governments seek to work with markets rather than displace them. But they take the lead in shifting the structure of the economy towards sustainable development in conjunction with institutions such as GEO.

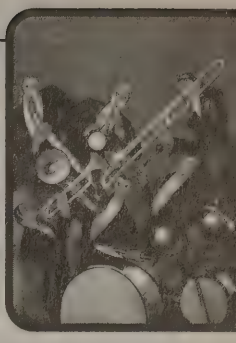
## jaZz

In the world of Jazz, diverse players join in ad hoc alliances to solve social and environmental problems in the most pragmatic possible way. The keynote of this scenario is dynamic reciprocity. This is a world of social and technological innovations, experimentation, rapid adaptation, much voluntary interconnectedness, and a powerful and ever-changing global market. Businesses believe they cannot operate against the greater good for long.

What enables the quick learning and subsequent innovation in Jazz is high transparency—the widespread availability of information about ingredients in products; sources of inputs; company financial, environmental, and social data; government decision-making processes; and almost anything else concerned consumers want to know. Many players are involved, in part because of the way information continues to level the playing field. The challenge to both business and government is encouraging transparency within their organisations.

Government is most active at the local level. Ad hoc local and global institutions arise to solve particular problems. Mediation becomes a major method of problem solving. In this world, where transparency is required, particular "green" behaviours are not the major focus, even though such behaviours are rewarded. Achievement of the new environmental and social standards occurs largely out of self-interest. The public recognizes transgressions and quickly acts against companies or countries that violate standards. Companies have an interest in seeing that disputes do not escalate and indirectly harm them. They monitor relationships with customers and suppliers closely, and drop risky partners quickly. In this highly competitive and interconnected world, businesses see the strategic economic advantages of being perceived as environmentally and socially responsible, and many become proactive leaders in responding to social and environmental challenges.

Jazz is a world in which NGOs, governments, concerned consumers, and businesses must act as partners—or fail. Together, along with other players, they learn effective ways of incorporating environmental and social values into market mechanisms. ⊕



**"Jazz knows no absolutes, there is no best way to perform..."**  
 - Martin Williams

THE BROCHURE OF THE WORLD BUSINESS COUNCIL FOR SUSTAINABLE DEVELOPMENT CAN BE DOWN-LOADED FROM WWW.WBCSD.CH/PRINTPDF/SUMMARY.PDF.



# CHINA, AFRICA, RUSSIA, INDIA

one of the planet's foremost green think-tanks considers global scenarios

The Balaton Group is an informal association of systems folks, resource experts, activists, teachers, and friends working in their home countries toward a sustainable society. They meet yearly for five days on the shore of Lake Balaton in Csopak, Hungary. They support the work of members and encourage networking and mutual support among sustainability leaders. It's been a low-budget, low-profile organization. This is the first time its deliberations have been published outside its newsletter. We thank the Balaton Group for its generosity and Donella Meadows for all her help.

In October 1998, the Balaton group discussed the scenarios of the Intergovernment Panel on Climate Change (IPCC). The scenario we call "Hypermarket" emphasizes competition, globalization, individualism, and technological progress as a solution to scarcity, high throughputs, and information as both property and power.

The IPCC scenario we're calling "Regional Stewardships" emphasizes holism, partnerships, decentralization, ecological carrying capacity, skewing the market to preserve diversity, self-regulation under stewardship guidelines, transparency of information, and cooperation.

Here, in conversation with Balaton members, four celebrated appraisers of their respective countries respond to the Hypermarket vs. Regional Stewardships scenarios. —PW

## Russia

Commentary by Vladimir Kollantai

Vladimir Kollantai works at the Institute of World Economy and International Affairs of the Russian Academy of Sciences.

**E**xtrapolation is not a useful exercise for looking at a future of Russia. Most trends are going in the wrong direction. Population is decreasing. Production is decreasing. Russia is probably the most unpredictable area in the world. We lurched too strongly into Hypermarket and outward trade. But very recent events (some happening during the Balaton meeting) give a ray of hope.

We should begin by understanding that Russia has been living for more than three centuries with traditional Regional Stewardships overlaid by a Hypermarket. Russia is a vast area with a severe climate which has furthered a national character of endurance, stubbornness, and survival. It has been a frontier, with no particular need for social compromise. There has always been extremism, lurching from one experiment to another. Russia is so big, with such momentum, that it's very hard to change. Change, when it has occurred, has come mainly through smashing.

Russian society developed under strong central

power with few limits. There wasn't so much difference between the czars and the Politburo. Modernization came in the form of transplants (culture from France, technology from England and America), but the Russians remolded all the transplants their own way. Russians saw bureaucracy, the major transplant, as foreign, oppressive, and to be resisted and foiled. Therefore they show little respect for the rule of law and make an interesting mental distinction between "legal" and "legitimate." But the Soviet era brought highly progressive ideals (never realized), which had and still have the support of the population.

Hypermarket and Regional Stewardships exist side by side throughout the land; Hypermarket trying to modernize, Regional Stewardships clinging to old truths and habits. They lend themselves nat-



Destiny-in-waiting, Yaroslavl, Russia.

ANNE FISHERIN. FROM DOUBLE TAKE, VOLUME 3, NUMBER 4, FALL 1997.

urally to division into formal and informal economic sectors, far apart in productivity, technology, and mindset.

Population is dropping in some years by as many as one million people, which will lead to a labor shortage in twenty to thirty years; for now it is compensated for by abandoning obsolete productive facilities and by an influx of refugees, especially Russians returning from former USSR states. In the future, there will probably be vast immigration from China, Korea, and Mongolia.

The old Soviet regulatory mechanism has now been smashed, but nothing has been put in its place. There is no effective law enforcement, hence an outbreak of crime. No planned or regulated economy, hence black markets and Mafia. The old specialized economy, in which different units sent products directly to each other, is gone, and people long for some hierarchy to restore it. The people have to learn that freedom does not work without responsibility. (Freedom is loudly shouted, responsibility is still under the table.) They are like a submarine crew put suddenly into a jet plane. They are forced to learn fast; now many people understand the market, though they don't especially like it.

The Soviet system paid people half of what they needed, so they moonlighted. They learned to keep a part of themselves for themselves, not for society. The military was organized and privileged; it gave lucrative contracts to industry. When these contracts disappeared, industry went on building weapons and selling them wherever they could. Atomic weapons are dispersed throughout the country, probably in a fourth of the regions.

The fundamental driver of a market, the purchasing power of the people, has been ignored—indeed, the International Money Fund took what was left of it away. So entrepreneurs can only make money by selling abroad [or on the black market].

We have no reliable statistics; the first person arrested under the new anti-corruption laws was the head of the statistical office. The resource base, which was always used inefficiently, is now crumbling. We're pumping out every last raw resource. Mines, often in uninhabitable areas, are deteriorating, and people are leaving. Those areas will be needed some day, but we're losing them.

Manufacturing will always be uncompetitive because of large heating and transport requirements (balanced at the moment by low wages). If Russia has any economic future, it has to be in educating our people, and in high technology.

The environment has a low priority. Pollution-control mechanisms were the first part of the econ-

omy to fall apart. So wherever production increases, pollution increases. There are forest fires in Siberia. The Caspian Sea's level is dropping, its water is being polluted by oil production—so that's the end of the caviar. The shadow economy is lawless about environmental regulations, as it is about everything else. Environmentally sound technologies are more expensive, so forget them. Transnational corporations are consciously selling old, dirty equipment—forbidden elsewhere—to Russia.

Hypermarket people are flocking in with money and paradigms. Someone needs to make a serious case for modernized Regional Stewardships. Russians do not want to go back to being peasants. They want to make a decent living. They are educated and cultured and inherently full of regional stewardship values, but they are understandably untrusting. The "Tolstoy communes," which sprang up in Russia's "back to the land" movement of the nineteenth century, were flops. If you come in with Regional Stewardships, you have to have a better plan than that.

**Gilberto Gallopin:** The last two generations of Russians were raised to expect their basic needs to be met by the state as their right. What kind of system can arise out of that mentality?

**Vladimir:** That will be a big question, especially after one more generation. Now we have ads all over the media for nonbasic needs—Pampers, chewing gum. We could imagine several scenarios for Russia, mostly dependent on what comes from outside. It could be brutal. The population has its back to the wall. Society could degrade. On the other hand, there's a self-awareness, a philosophical ability to distance ourselves from our own dilemma. We've been conducting a wonderful discussion about our real values for about twenty years. That discussion just isn't getting out.

**Dennis Meadows:** Tradition and values could be the key to a Regional Stewardships revival. After all, the Tolstoy communes lasted longer than the Soviet state did.

Can old mindsets be reclaimed or are they irreversibly warped? Is there any sort of backward direction possible, culturally, or are there only choices of totally new ways forward? - Vichi Robin

Gilberto Gallopin, a native Argentinian, currently works at the Stockholm Environment Institute.

Dennis Meadows directs the Institute for Policy and Social Science Research at the University of New Hampshire.

## Africa

### Commentary by Joan du Toit

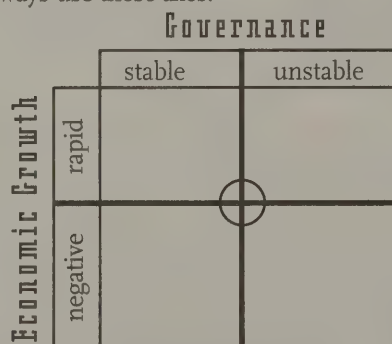
Africa as seen by official world agencies is very different from Africa as seen by Africans. The global, official view emphasizes:

- average life expectancy: 54 years
- total fertility: 5.3 children/woman
- infant mortality rate: 86/1,000 live births
- crude death rate: 13/1,000 people
- percent rural: 65
- percent under 15 years of age: 43
- autos per capita: 0.02
- televisions per capita: 0.04
- population: 778 million, growing at 2.5 percent per year
- GDP per capita: US\$639 and declining

Joan du Toit does energy futures reports for South Africa at the Institute for Futures Research in Stellenbosh.

Per-capita food and energy consumption is also declining, though the energy part is hard to measure because perhaps 70 percent of energy use is in the form of unmarketed traditional fuels. As a result, forests are disappearing rapidly—down 3.5 percent just from 1990 to 1995. Only about a third of the original forest remains. Carbon dioxide emissions are slightly over 1 ton per person per year, not counting fuel wood. Withdrawals for agriculture constitute 88 percent of water use, but only 6 percent of cropland is under irrigation.

Scenarios by various global groups (e.g., IPCC, World Bank, World Business Council for Sustainable Development) don't seem relevant to Africa. In contrast, African scenario exercises always use these axes:



To illustrate, one extremely influential use of this “African matrix” occurred in Mont Fleur [see p. 85]. The scenarios developed from this matrix had a great deal to do with preparing the minds of leaders—including recalcitrant leaders—for South Africa’s transformational change.

African political leaders consider the rapid-growth, stable-government quadrant to be the only possibility for sustainable development. The environment is usually a low priority. Look, for



Europe and Mali; two sartorial worlds—one sustainable future?

SEYDOU KEÏTA, FROM SEYDOU KEÏTA, ANDRÉ MAGNIN, ED. SCALO, 1997.

instance, at South Africa’s new energy policy:

*Whilst the long-term ecological sustainability of the energy sector is desirable, government’s current view is that the immediate priority is to address those environmental problems which affect the living conditions of millions of people on a daily basis. Amelioration of these conditions is seen as the first step on the path to achieving a more harmonious balance between society and the environment.*

All of Africa is locked into poverty in spite of rich resources. Over 130 percent of the continent’s annual GDP is required just to service its existing debt (which is, obviously, not being serviced). By 2005 every third person in Africa will be food-insecure. Health problems are rising, especially malaria, tuberculosis, and AIDS. Sub-Saharan Africa has an estimated twenty-one million people living with HIV; 68 percent of the world’s total, 7.4 percent of the adult population. AIDS has reduced average life expectancy in Burkina Faso by eleven years; in Zimbabwe by twenty-two years.

To be more sustainable, Africa needs:

- *Increased awareness of the plight of the poor.* Tony Blair calls for joint efforts to stop the resurgence of malaria. Nelson Mandela declares the next century to be the age of the once-downtrodden. Increased awareness can lead to more direct investment in urgently needed social and natural capital.

- *The concept of an African Renaissance.* Self-reliant people set their own development agenda, cooperate regionally, maybe show the rest of the world the way to Regional Stewardships! [Perhaps a Regional Stewardships scenario could be called “guinea fowl”—indigenous; not beautiful, but useful and well-adapted.]

- *Regional energy cooperation.* Africa has abundant energy resources, especially in renewables. What it needs are capital and technical skills. Solving energy problems means greatly increased direct and indirect economic productivity, for example by releasing all the time women spend gathering fuel.

• *Eco-tourism.* It could create jobs while also giving real value to the environment and providing funds for environmental protection.

**Tom Odhiambo Ojienda:** We must destroy the “myth of no hope” for Africa. Each traditional tribe had practices and beliefs and deep knowledge about the management of local resources. They had no concept of dividing or titling land or other resources. It wasn’t until their traditional schemes collapsed that people were thrown into poverty—poverty now reinforced by the IMF and World Bank. Let Africans go back to basics, reclaim their traditional understanding. Look at Africa in terms of rejuvenation; don’t write us off.

(40 to 50 percent), and the poor, forgotten, and invisible (30 to 40 percent). These classes are also interknit, through connections of education, profession, vocation, family, place, and institution. There will never be one India. A scenario requires recognition of at least five future Indias:

**Global-industrial India** has 300 million people with an average per-capita income of US\$400–\$459 now, but \$3,000+ by 2020. Much of the growth will come from selling resources, especially minerals. They are highly mobile, even internationally; some have second homes in the UK or US. They are linked into efficient modern infra-

structures, consume a lot of energy, and buy protection and privilege from the government.

**Agro-industrial India** has 200 million people, with an income of US\$300 per capita, rising to \$1,000 by 2020. They have moderate mobility and trade connections. They are entrepreneurs and innovators (who have adapted washing machines

to mix up commercial quantities of the Indian drink *lassi*, for example), and political brokers. They travel by train and car more than by airplane, are moderate energy consumers, and strongly identify themselves as Indians.

**Small India (or Regionalist India)** is seventy-five million people with an income of US\$200 per year, growing to \$500 in 2020. The people have little mobility or financial exchange and form pocket economies, often in scenic places where they serve tourists. They are spiritual people, political losers, and consume little energy. They travel by bus, if at all. They identify themselves more as “others” than as Indians.

**Laggard India** consists of 200 million people, many of whom work for, trade with, or identify with the agro-industrial group. Per-capita income is US\$100–\$175, maybe \$225–\$375 by 2020. Subsistence farmers fit here, as do employees of small industries. There is a high dependence on government dole, highly inefficient energy use, and a dispersed identity.

**Historic India** is disappearing, though it still comprises 250 million people. They make less than US\$100 per capita per year, and probably won’t be much above that in 2020. They live with nature, are often exploited, exchange commodities



## India

Commentary by Somnath Sen

India is too big a country with too many sub-cultures to fit into any simple A or B scenarios. To many Indians, futurism seems a luxury anyway, given our present problems. Our Planning Commission does put forth fifteen-year plans, which are always hopeful—at least until the rain gods fail us.

I did a sort of modified Delphi exercise [see p. 78], and found some clear dominant trends for India as a whole. Population is increasing rapidly, but birth rate is falling. The population will soon be 50 percent urban. There is increasing resource conflict, exacerbated by local and regional interest groups (simultaneous with increasing nationalism and “Indianness”). Economic trade and aid links are increasing; there are more transnational corporations, small entrepreneurs, and enclaves of the rich. There is a middle class rising in power. Infrastructure is increasing, forests are decreasing, water supply is becoming critical. We see more underemployment and crime, also more consumerism, modernization, and technical fixes. Tourism is rising, as are class conflicts, regional consolidation, and balkanization.

Perhaps the most important fact about India is its inverted pyramid of wealth and control. Less than one percent of the population forms the wealthy cream of society, and another 4 percent the top élite. The whole works to the benefit of this 5 percent, who skew all the indicators. Then come the upper class (6 to 12 percent), the middle class

and labor more than cash, and have almost no infrastructure. Their energy consumption is very low. They have a weakened, fatalistic outlook. They travel by cart or on foot. They are written off.

This doesn't fit neatly into a Hypermarket-Regional Stewardships framework. India has clear elements of both Hypermarket and Regional Stewardships, probably diverging and conflicting with each other as the future unfolds.

**Bishan Singh:** All scenarios are Western in perception. Both Buddhism and Hinduism start by looking inside, not outside. "Something not compatible with me cannot be going right. What am I doing to create that wrongness?" That philosophy would say that we can create Regional Stewardships directly, not by going through Hypermarket or modified Hypermarket, and we can create it within ourselves.

### China Commentary by Qi Wenhui

The World Bank has systematically underestimated the growth of China, but now it is probably overestimating it.

China's 1995 GDP was twice what the World Bank had projected in 1985. China is now the world's #1 producer of coal, cement, cotton cloth, television sets, grain, and meat. It

is #2 in chemical fertilizers, #3 in steel, sugar, and electricity. The World Bank predicts that:

- China's population will reach 1.5 billion by 2020 and peak in 2050 at 1.6 billion. (Between 1995 and 2020, China will grow by about the same number of people as the present total population of the United States!)

- China's GNP is projected to grow from US\$0.3 trillion in 1990 to \$17.1 trillion in 2040 (a multiplication factor of 50!), while per-capita income rises from \$300 to \$11,000. China's economy by 2040 will be fully modern, industrial, and market-based.

- China's forecasted energy demand for 2020 is 2.4 billion tons of coal, 0.43 billion tons of oil (0.16 imported), and 143 billion cubic meters of natural gas (42 imported). I don't take this forecast at all seriously. It ignores increasing stress on domestic and international natural resources. China considers food security a top priority. It has to try to feed 20 percent of the world's people off only 7 percent

of the world's cultivable land (and the 20 percent is rising while the 7 percent is falling). Water is probably the most constraining resource.

China has to think through the implications of an aging population and of an economy that suddenly goes from scarcity to surplus of consumer goods—which means that China has to find reliable markets. The environment is deteriorating, and there is increasing awareness of that. Links with the rest of the world are increasing, especially through trade. That can be a good thing, helping China cope with the obvious problems ahead.

Like other countries we have looked at here, China is currently a mixture of Hypermarket and Regional Stewardships. The discrepancies between these two Chinas are widening. Perhaps parts of the traditional culture and values will recover and combine with similar values coming from the West to move China toward Regional Stewardships. We have a long tradition of saving, not wasting. We are not materialistic; we are being driven toward materialism by the West.

**Bob Wilkinson:** The Chinese are the "farmers of forty centuries." There is such a tradition of sustainability; we could learn so much from it. But this one century could wipe all that wisdom out. It's very frightening.

**Wenhui:** Traditional agriculture in China is sustainable, but modern agriculture definitely is not. It makes no sense; we have enough labor to continue traditional agriculture. The government has a policy of no net loss of arable land, but does not enforce it. Chinese scientists are concerned about climate change; the government isn't. From long habit, farmers typically have two years' worth of grain stored at any given time, without the government's knowledge.

**Bishan Singh:** I have worked in China the past four years. It has a strong culture of recycling; I never saw its equal elsewhere. But China is playing to the Hypermarket gallery and destroying decades of social investment. The first Cultural Revolution was bad; the second one is worse. Capitalism is changing all thinking. Rural areas have gone from communes to enterprises. The land is three times more productive, but these gains cannot last. The Regional Stewardships has only one hope in the world and that's China. We have to support them morally and culturally so that they don't lose their traditional wisdom.

**Wenhui:** If we keep our distance from the rest of the world, we can keep our culture. ☪

Bob Wilkinson is a professor of environmental studies at the University of California, Santa Barbara.

Bishan Singh recently directed a farm cooperative program for Asia, based in Bangkok, Thailand. He has just returned to his home office at the Management Institute for Social Change in Makmur, Malaysia.

BELOW: "YOUTHFUL DANCESTEPS" (QINGCHUN WUBU), 1983. FROM CHINESE PROPOGANDA POSTERS, STEFAN LANDSBERGER. THE PEPIN PRESS, 1995.



China's uncertainties: Hypermarket, Regional Stewardships, Western forms, Eastern traditions. Which swingstep prospers?

Qi Wenhui is part of the System Analysis Group at the Commission for Integrated Survey of Natural Resources of the Chinese Academy of Sciences in Beijing.



# Futurama Retro

Scenarios, theme parks, science fiction, fantasy, and horror stories are not so far apart

AN INTERVIEW WITH JOHN CLUTE

**PW:** Could we start with the connections between science fiction and scenarios?

**Clute:** Both science fiction and scenarios are sets of stories that are arguably possible, in terms of our understanding of science, history, and human nature. I have considerable admiration for some of the recent scenario work, especially as it has evolved from reactive, project-bound scenarios to creating flexible scenarios such as those Adam Kahane describes (page 82). Flexible scenarios have an analogue with good science fiction: stories that posit particular outcomes covering a fairly wide range of possibilities.

In general, science fiction of the twentieth century has paralleled scenario writing. Up until the 1960s or 1970s SF plots and strategic plans both had a kind of pointed projectile shape.

They basically told a single story (with lots of subplots and contradictions): how big things held in the big fists of men could redeem the times, penetrate the future, guide us, and be our tools as we explored and conquered the solar system and other systems of the universe. That particular story, written from what one might call a "First World" perspective, claimed that the twentieth century as Americans saw it in the 1940s could really be made to work.

This big-fist science fiction began to die with Sputnik in 1957. By 1975 or 1980, stories written in that particular mode tended almost universally (with some honorable exceptions) to be retro stories, consciously set in readers' psychic pasts. They were nostalgic for the time when the future was one thing that we could step into and shape. For instance, Kim Stanley Robinson's "Mars Trilogy" is technically in the old mold, although he complexifies it and makes it so realistically applicable to our own solar system that it doesn't really feel like the old science fiction at all.

Nowadays, the best science fiction stories tend not to be written from that model, which doesn't work very well for the human race at the birth of the twenty-first century. We need a kind of science fiction novel which is going to operate to give us some "suss," to use the British term—some kind of balanced street-wise savvy as to the nature of what is happening and what we can do to survive and raise our extended families (or, perhaps, inhabit our extended families). It is not about colonization of other peoples and planets. The most interesting recent SF is about being centres of consciousness in a sea of that which is being colonized. Our bodies are colonized by the corruption of the world around us, but our bodies survive; our minds are colonized by the superflux, the overflow of information, but our minds spin that superflux and somehow we manage to keep our heads above this extraordinary set of waters rushing around us.

Excellent science fiction stories now are written out of the astonishing complexity of the worlds that are coming down upon our necks. A really good example, which takes as its compass the near future, perhaps up to fifty years from now, is Bruce Sterling's *Distraction*. It is to my mind an absolutely brilliant book, and utterly unlike the science fiction that was being written twenty years ago.

Its protagonist, Oscar, is in effect an evolution of the spin doctor. He operates at the boundaries of most of the worlds in which he penetrates. He attempts to make sense of a world in which information is so rich that the only way you can survive information is to spin it. He is obviously a trickster.



*Distraction*  
Bruce Sterling.  
1998, 440 pp.  
\$23.95.  
Bantam Books.



FROM SCIENCE FICTION: THE ILLUSTRATED ENCYCLOPEDIA (SEE REVIEW, PAGE 104).

We need a model for an attitude toward being in the present tense of this century, as it turns into the next. The trickster—Hermes, Prometheus, Bugs Bunny—is an obvious one. The trickster shows us that we cannot sit in either this or that; we have always to be on the fence, to be understanding the before and the after, the yes or the no. We can't get caught in any particular world because to be caught in a single world in 1999 is to die.

The trickster takes many guises, from folk-like Prometheus down to what one might call a "blockhead" trickster who manages to survive by battering his head against a dozen walls. We often see blockhead tricksters in cartoons; the American cartoon industry loves them. I think the early creators of Bugs Bunny knew very well that, by creating a cross-dressing hare, they were creating a classic transgressive trickster. Blockheads are always tricksters that die, and as soon as they're dead, just jump up and continue on.

**PW:** The best scenario writers say scenarios can free us from the assumption that the future has only one predetermined direction and help us prepare for multiple possibilities.

**Clute:** The flexible scenarios apparently follow this model. We want a model that says, "If we

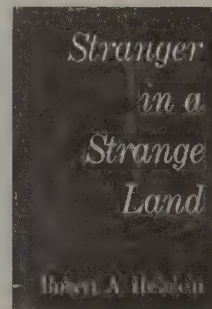
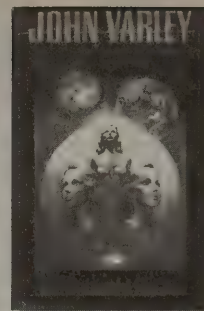
die, we pick ourselves up off the pavement and blow ourselves up again," like a toon in *Who Framed Roger Rabbit* (Disney, 1988). Bruce Sterling's Oscar is the kind of guy I want to have spinning the world as the thousand futures start pell-melling down around our shoulders—which they already have.

This kind of science fiction is not written very often because it is difficult to write. When it does appear, I think it is enormously significant and, in a sense, highly predictive. It's not predictive of a particular event (although Bruce Sterling is a very, very bright man and he predicts a lot of things). Its real function is to prophesy the states of mind and physical being which will bring us through, in a balkanized, turmoil-ridden world.

### *Exile and Home*

**Clute:** Some of the best science fiction written in the last twenty or twenty-five years argues, implicitly or explicitly, that we have exiled ourselves from the planet Earth. That we have destroyed it. That it is essentially too late. That the Earth that we remember will never be our home again because we have exiled ourselves from it. The best metaphor for that, a very physical one, is in John Varley's novels, especially *The Ophiuchi Hotline*. Throughout his career, since he started writing in the mid-1970s, he has consistently presented the model of the human race as having literally been exiled from Earth, occupying niches and crannies on various planets of the solar system. And doing very well, thank you. But the exile is literal. An alien race comes and says, "You have fucked this up so badly that you are no longer going to be allowed to stay on this planet," and kills most of the earthlings, and exiles the rest and lets the dolphins and whales, to whom they are related, live in peace. That is an increasingly powerful metaphor for our existential state.

John Varley really rang the death knell of Heinlein as big-story SF (e.g., *Stranger in a Strange Land*, *Double Star*). It was a blow struck from within the circle of conspirators, Brutus killing Caesar. *The Ophiuchi Hotline*, in 1977, was a very important book for that reason. It did its job, ensuring that serious people no longer think there's a single story to tell, a single conceptual breakthrough, a single scenario or set of scenarios which enable a particular cadre to float. In spite of Varley and others, I must say that 90 percent of science fiction is still First-World SF, the old kind of stuff, nostalgic writing.



Former victims turn into persecutors. *Planet of the Apes*, 20th Century Fox.



The contrast is stark if you compare the old stuff with Bruce Sterling's Oscar, in *Distraction*, who operates as close to a state of non-exile, of non-estrangement from the weirded-out world of 2040, as is possible to conceive. I find that intensely admirable. I want somehow to anticipate that children (not my literal children but the children I am involved with in my life) will not grow up as exiles on this planet—nor as owners of this planet, because they'll only cinder it if they end up owning it. They must somehow become tricksters, bouncing balls, floating buoys.

## Fantasy

**Clute:** Science fiction, no surprise, is a twentieth century literature. It is perhaps more surprising to think of fantasy as a literature which has come to maturity and is significantly mired in this century. Fantasy says that the twentieth century is wrong. Science fiction, on the other hand, says that the twentieth century can be made to work. There is cognitive continuity between the world and SF. In fantasy, there is none.

I've worked up a four-stage model in the *Encyclopedia of Fantasy*. First is the initial detection of wrongness, when you hear of the Nazgûl haunting the shire. Then comes the long complex process of "thinning" which involves wars and clangor and all sorts of things which don't sound thin, but in reality are very much thinning. Recognition follows, the moment of turning when the story or memory or land is recovered. Finally,

there is healing (which might only take a couple of pages because healing is embarrassing to talk about nowadays).

Fantasy stories model what we've done to ourselves on this planet by showing threats to their own constructed worlds—desertification, amnesia, loss of use, the bondage of turning into stone. The characters and lands of fantasy suffer a threat which I call "thinning"—an ontological thinning: the being of people thins out; the world gets superficially more complex but there's nothing there. That world is the world out of which great fantasy novels offer a form of transformation. They say, "This is what is happening to the world because you have forgotten yourself, you have forgotten the story, you have forgotten how the land works."

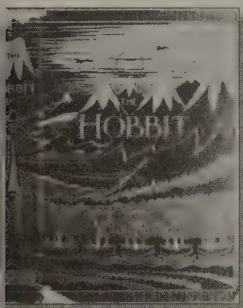
How SF, fantasy, and perhaps scenarios, turn—how they move towards their outcomes—speaks to what kind of world the writers envision. In science fiction, the Conceptual Breakthrough was the moment at which the old world was

understood in terms of how to get to the next world. In fantasy novels, the corresponding term is Recognition. It is the moment when the characters recognize the Story they are in, or the Memories they have suppressed, or the true nature of the Land they must redeem. The past is recovered because "reality" is the real story. You're recognizing the nature of what has always existed, as opposed to breaking through into what is going to become.

In fantasy, we must have a moment of profound recognition; we must somehow or other get out of this fantastical trap. And then things turn, sometimes very literally. The protagonist remembers who he is, the novel itself recovers the story that it's all about, the lands suddenly turn green, the Fisher King no longer has his wound, and healing begins.

Now, this turning itself is a fantasy; it is all counter-factual. We know the story doesn't change just because you recognize it, not in 1999 or 1969. This is not what happens in the world; but fantasy sets up these models of the recovery of soul, the story, or a just and green and pleasant and livable land as a set of counterfactuals for us to learn wisdom from.

Gandalf in *The Hobbit* is a fantasy-world trickster, appearing and disappearing when goblins and trolls threaten. He is based on a German mountain spirit named Rubezahl, shown below.



## Thin Theme Parks

**PW:** In some scenario workshops, corporate managers do seem to express a desire to remember who they are in the story, in order, in a way, to heal the land. They've worked so hard for years, maybe forgotten the Earth or their children as future. What you're defining here is a strange moment when scenario building (a form of science fiction) turns into or recognizes fantasy.

**Clute:** I think so. I think you've said it as well as I would, certainly. As you transcribe the interview, just say that I nod my head wisely here.

The superficial complexity which does characterize so much of the world we live in, the "thinned out" complexity, is not normally contradicted or redeemed by scenario writing. Scenario writing is itself necessarily, as a form of cognitive operation, a form of thinning. For that reason, whenever I read scenarios, especially reactive scenarios, I find myself thinking about how similar a scenario must be to the mindset and working plans of someone who is creating a theme park. Theme parks are forms of thinned reality. A theme park is what, extending my model of fantasy, happens when the process of thinning gets stuck.

Technically, stuck stories are known as horror stories. Vampire stories, werewolf stories—any stories which involve a supernatural element imposing itself on this

world—are essentially stories in which wrongness does not get transcended. The thinning isn't transformed to recognition; you just get the wrongness. You sense that something is wrong and somebody out there is trying to seduce you into believing it's right. Some idiot werewolf devouring infants and corpses or some vampire, through sex, is trying to persuade you that its life is better than yours. The thinning, if it gets stuck and doesn't pass on to something else, is ultimately about the violation or the rupturing of life.

Theme parks are horror stories; they are another kind of thinning that has gotten stuck, and they terrify the shit out of me. What is so very terrifying about America's theme parks, and the "theme parking" of our lives: it is seductive because it's easier to live in a dollhouse than in the world.

Theme parking by definition is a form of retro because it creates the illusion of a world under control. Every time you attempt to control the world, you are creating a retro device, because the world is never going to be controlled.

Millennialism is also retro in this sense. It is essentially a way of creating a one-act, one-story scenario of the world. In my upcoming *The Book of End Times*, I depict millennialism as a kind of scenario which tragically misrepresents the nature of the world. We are going to have apocalyptic events by the score coming down around our necks, but we're

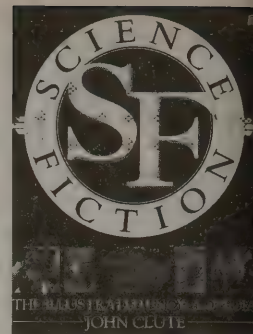
not going to have anything as simple and stupid as a millennium. So the millennium is a model, a scenario, that like the theme park acts as a seizure upon the world.

Unfortunately, most organizations are also, necessarily, thinned complexity. Organizations that

## SCIENCE FICTION The Illustrated Encyclopedia

John Clute. 1995;  
312 pp. \$39.95.  
Dorling  
Kindersley.

Our most sought-after image book; our continually re-researched text. Alternate worlds, ecotopias and dystopias, gender roles, global conflict, love and destiny—it's all here, spectacularly. (John's *Encyclopedia of Fantasy* will be re-issued this spring).—PW



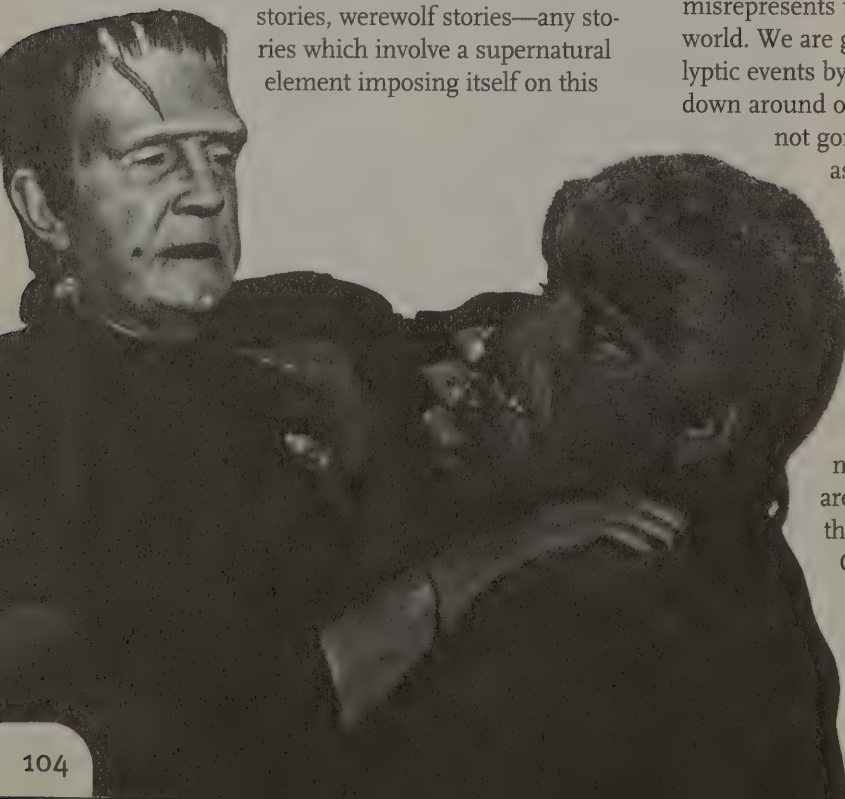
believe they are inherently, rather than instrumentally, forms of enrichment, are organizations which, I think, are ultimately very dangerous.

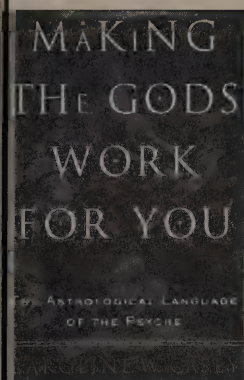
In a world that cannot be controlled, it is much less clear how fantasy can define the steps—create the open scenarios—necessary to get from here to a better world. SF, after all, depends on being read as a continuation of history by new and other means. Fantasy depends on being read as a refusal of history. ⊕

John Clute is a singular man and writer, immense in scope, brave and clear as he persistently winnows and distills the essences of stories through his own conscience and understanding of history. Winner of many awards, he has tracked science fiction, fantasy, and horror genres for over thirty years, with two encyclopedias, two books of essays (*Strokes* and *Look at the Evidence*), and contributions to major newspapers and magazines. He is also as patient as Yoda, re-creating his thoughts when our retro taping system broke down. He commutes between Maine and London.

*Strokes* (out of print).  
*Look at the Evidence*. 1995;  
465 pp. \$15 (\$18.50 post-paid). Serconia Press.  
Available from John D. Berry  
Design, 507 11th Street, #2,  
Brooklyn, NY 11215,  
jberry@itcfonts.com.

Frankenstein  
meets the  
Wolf Man (US  
Universal).





**MAKING THE GODS WORK FOR YOU**  
The Astrological Language of the Psyche

Caroline W. Casey, 1998; 277 pp. \$23. Harmony Books/Crown Publishers.

This book on astrology, the first ever reviewed by Whole Earth, has

one grand purpose: to help people find the kind of activism that best suits their destiny and persona. Caroline Casey was the featured speaker at the Green Party's political convention, and hosts an activist/astrology radio show. She's a great storyteller, especially on the subject of planetary energies; the book is laced with fairy tales, jokes, and news clippings. With fun, jive, and wordplay, *Making the Gods Work* offers great guides for personal rituals and freeing up obstructed organizations. You also get basic info on astrology—how to cast a horoscope, interpret the positions of planets, and determine where the sun and moon were on the day of your birth. —Suzie Rashkis

“Visionary Activist Principles

The following principles are derived from my own years of serious whimsy and musing, and their spirit suffuses the text of the book.

**Principle 0 (ZERO).** Believe nothing, entertain possibilities. Therefore everything hereafter is offered playfully.

**Principle 1.** Imagination lays the tracks for the reality train to follow.

**Principle 2.** Better to create prophecy than to live prediction. What makes us passive is toxic. What makes us active is tonic. This is the difference between predictions, which make us passive, and prophecy, which is active co-creation with the divine.

**Principle 3.** The invisible world would like to help, but spiritual etiquette requires that we ask. Help is always available (operators are standing by).

**Principle 4.** The only way the gods know we're asking for help is ritual.

**Principle 5.** If something's a problem, make it bigger.

**Principle 6.** We only possess the power of an insight when we give it expression.

**Principle 7.** Creativity comes from the wedding of paradox. We aspire to be disciplined wild people who are radical traditionalists.

**SHAMBHALA**  
The Sacred Path of the Warrior

Chögyam Trungpa. 1988; 209 pp. \$13. Shambhala Publications, Inc./Random House.

This is a quiet book. It feels trustworthy. Shambhala is—or was, actually—the metaphor for an enlightened society (peace, prosperity, compassionate and enlightened rulers). To discover it requires journeying into a secular/Buddhist meditation program. This project prepares participants to become spiritual warriors, to reduce pain and suffering in our not-so-enlightened society.

Chögyam Trungpa advises readers that the future (or past) can be the illusions perpetuating sadness, dissatisfactions, or desires. The practice he describes focuses on tuning in to your own tender-heartedness, accepting your own vulnerabilities. With clear respect for your own fragility, you can go on to become a warrior, a robust warrior grounded in self-acceptance. The workability of every situation (political, familial, environmental, economic) arises not from Will or Willpower but from recognizing what Trungpa calls the basic goodness in every human and the basic beauty of the world. —SR

“The principle of nowness is also very important to any effort to establish an enlightened society. You may wonder what the best approach is to helping society and how you can know that what you are doing is authentic or good. The only answer is nowness. Now is the important point. That now is a real now. If you are unable to experience now, then you are corrupted because you are looking for another now, which is impossible. If you do that, there can only be past or future.

When corruption enters a culture, it is because that culture ceases to be now; it becomes past and future. Periods in history when great art was created, when learning

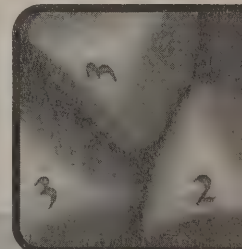
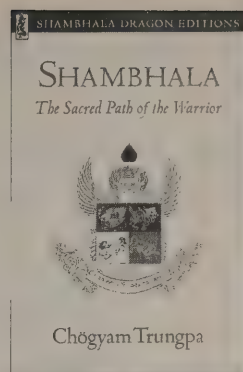
advanced, or peace spread, were all now. Those situations happened at the very moment of their now. But after now happened, then those cultures lost their now.

You have to maintain nowness, so that you don't duplicate corruption, so that you don't corrupt now, and so that you don't have false synonyms for now at all. The vision of enlightened society is that tradition and culture and wisdom and dignity can be experienced now and kept now on everyone's part. In that way there can never be corruption of any kind at all.

...You may feel that you have a good vision for society but that your life is filled with hassles—money problems, problems relating to your spouse or caring for your children—and that those two things, vision and ordinary life, are opposing one another. But vision and practicality can be joined together in nowness.

Too often, people think that solving the world's problems is based on conquering the earth, rather than on touching the earth, touching ground. That is one definition of the setting-sun mentality: trying to conquer the earth so that you can ward off reality....Shambhala vision is not trying to create a fantasy world where no one has to see blood or experience a nightmare. Shambhala vision is based on living on this earth, the real earth, the earth that grows crops, the earth that nurtures your existence.

...Even though you may be living in a city in the twentieth century, you can learn to experience the sacredness, the nowness, of reality. That is the basis for creating an enlightened society.



Spiritual Access

**Crystal Gazing**  
A Study in the History, Distribution, Theory and Practice of Scrying

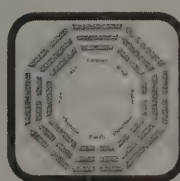
Theodore Besterman. 1995 (facsimile reprint of the original); 183 pp. \$17.95. Kessinger Publishing, PO Box 160, Kila, MT 59920, 406/756-0167, fax 406/257-5051, www.kessingerpub.com.

Everything your corporate manager needs to know, except who sells the most effective crystal ball. Anyone know?

**The Complete I Ching**  
The Definitive Translation by the Taoist Master Alfred Huang

1998; 542 pp. \$30. Inner Traditions International, One Park Street, Rochester, VT 05767, 800/246-8648, 802/767-3174, fax 802/767-3726, www.gotoit.com.

More understanding of the Chinese than the Wilhelm translation (see MWEC). Good to have both.



**Stick Dice**

©1999 David Patton, Ideashop. \$18 postpaid. Ideashop, 11105-A Mt. Rose Highway, Reno NV 89511, 775/849-7785, dpatton@intercomm.com

I Ching divination was based on yarrow stalks. The use of coins gives very different probabilities and undermines the frequency of “scenarios” you encounter. The three odd-shaped Stick Dice, based on Boolean algebra, give you yarrow-stick probabilities without the yarrow sticks. A great gift for busy emperors and stock brokers. Beautifully designed.

# Chicken Little, Cassandra, So Many Ways to Think about the Future

by Donella H. Meadows

Somewhere during the fracas that followed the publication of our book, *The Limits to Growth*<sup>1</sup>, I remember finding one of my co-authors, Jørgen Randers, pacing the office in frustration. In his lilting Norwegian-English, he lamented, "People just don't know how to think about the future!"

His complaint was that our book, which contained twelve computer graphs charting out twelve different possible paths for the human economy up to the year 2100, was being received as an absolute prediction. A prediction of doom, at that, though at least one of the graphs showed a future in which eight billion people maintain a European standard of living in a way that does not undermine the earth's resource base—probably one of the most optimistic forecasts anyone has ever made. We were trying to say that the future is a matter of CHOICE, and that sustainable, equitable, wonderful choices were possible. But we were heard through a cultural filter that apparently saw the future as PREDETERMINED, to be predicted, but not changed—certainly not chosen. That culture also clearly expected—or at least found thrills and excitement, headlines and newspaper sales, in the thought—that the predetermined future will be a disaster.

Disaster—what could be more fascinating? Think of the content of the nightly news. The undying story of *Titanic*. The movies about volcanic eruptions and asteroid crashes. The slight edge of glee in some of the more extreme Y2K fanatics. There is something utterly delicious about the thought of the End-Of-The-World-As-We-Know-It.

Back when Jørgen was pacing the floor, we were honestly shocked by the reaction to our scenarios. We had not thought much about the culture in which we were speaking, though we ourselves were part of that culture. But we were at MIT; we had been trained in science. The way we thought about the future was utterly logical: if you tell people there's a disaster ahead, they will change course. If you give them a choice between a good future and a bad one, they will pick the good. They might even be grateful.

Naive, weren't we.

We ignored thousands of years of crystal balls, Delphic oracles, tea leaves, astrology, prophets—all of which are still remarkably alive and well in the subconscious of the computer age. Mythology gives us few examples of the CONDITIONAL forecast: if you do A, the result will be B; if you do X the result will be Y...now you choose. Even when the ancient forecasts did happen to be conditional, somehow the hero (never, that I can remember, a heroine) inevitably made the disastrous choice. Orpheus can lead Eurydice out of the underworld as long as he doesn't turn around to look at her—which he does. Lord Krishna tells Yudhishtira that if he goes on gambling, there will be terrible consequences—and he goes on gambling. Siegfried can return the Ring to the Rhine maidens and bring peace to heaven and earth or keep it and bring down himself, his bride Brünnhilde, and all Valhalla—guess which he does?

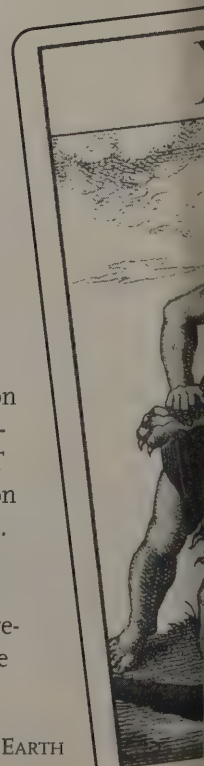
You know, I love that last scene of *Götterdämmerung*, where Brünnhilde charges into the funeral pyre and Valhalla crumbles and the Rhine rises to swallow up everything. Let's admit an inborn irresistible attraction to catastrophe and move on, because we are also formed by other myths.

There's Chicken Little, the sincere but silly forecaster of hysterical nonsense. Decades later some of our critics still put us in that box. I would prefer to be associated with the tale of the boy who cried "wolf"; at least there was a real wolf.

But the legendary prophet with whom I most feel a connection is Cassandra, to whom the god Apollo gave the ability to foresee the future, and then, after she displeased him, the terrible curse that no one would ever believe her. That story gives me shudders.

It also shows the ancient Greeks' sophistication about the perverse logic of prognostication. If people had believed her, then Cassandra WOULD'N'T have been able to foretell the future, because action would have been taken to avoid foreseen disasters. The Cassandra legend must be one of the earliest recorded human recognitions that there is a basic contradiction between prediction and choice. A predictable world has no room for choice; a choosable world is not predictable.

<sup>1</sup> Donella Meadows, Dennis Meadows, Jørgen Randers, William W. Begrens III. Universe Books, 1972.



# and the Real Wolf—

## Predictability and Choice

Of course the world must be made up of a complicated mixture of BOTH predictability AND choice; otherwise we wouldn't have been able to maintain for millennia such a rich legendry of predictions and inevitable tragedies, and simultaneously a belief in free will. In a brilliant essay on foretelling the future, E.F. Schumacher wrote:

When the Lord created the world and people to live in it...I could well imagine that He reasoned with Himself as follows: "If I make everything predictable, these human beings, whom I have endowed with pretty good brains, will undoubtedly learn to predict everything, and they will thereupon have no motive to do anything at all, because they will recognize that the future is totally determined and cannot be influenced by any human action. On the other hand, if I make everything unpredictable, they will gradually discover that there is no rational basis for any decision whatsoever and, as in the first case, they will...have no motive to do anything at all. Neither scheme would make sense. I must therefore create a mixture of the two. Let some things be predictable and let others be unpredictable. They will then, amongst many other

things, have the very important task of finding out which is which." (E.F. Schumacher, *Small is Beautiful*. Blond & Briggs, 1973.)

It isn't all that difficult to begin, at least, to get a handle on what kinds of things are predetermined and what can be chosen.

System dynamics—for instance, the sort of computer modeling we used in *Limits to Growth*—keeps careful separate track of physical things, which have to obey physical laws (e.g., material objects age and take time to construct; they cannot appear from or disappear to nowhere; they cannot be in two places at the same time), and goals and decisions. Physical things are, most of the time, predictable. Goals and decisions fall into the realm of information. Information is often subject to choice, change, rearrangement, improvement, deterioration, bias, utter derangement, or total transformation.

That distinction between physical stuff and mental stuff sounds simple and obvious, until you put the two realms together and have human choice interacting with, influenced by, and trying to influence physical things. Then can come surprises, for many reasons. Something in the physical realm may take a lot longer to move or change or unfold than anyone expects—or something may blow up. Something in the information realm (such as a concerted response to reduce greenhouse gas emissions) may stay stuck far longer

than it needs to, because of denial, paradigm blindness, lack of imagination, or entrenched opposition. Or something in the information realm that has been stuck for a long time (such as the legitimacy of the Soviet Union) may suddenly shift overnight.

A nuclear power plant, once built, generally operates predictably for fifteen to thirty years, but now and again human error produces a Three



TAROT CARDS  
AND ARTWORK  
CONTRIBUTED BY  
SUZIE RASHKIS.

Mile Island or a Chernobyl. Or human choice produces a Shoreham and a Zwentendorf, fully built plants in Long Island and Austria respectively, which by political choice were never started up.

President Nixon's "Project Independence," dreamed up after the 1973 oil embargo, promised that the United States would be free of imported oil by 1980. System dynamicists saw immediately (and later demonstrated with a computer model)

that, given the expected lifetime of installed oil-burning furnaces and cars and inevitable delays in finding and gearing up domestic oil wells, that goal was physically impossible. (An amazing amount of political discussion is directed toward goals that are physically impossible.)

Mix physical beings with mental models, and choice becomes—maddeningly—a matter of risk. The fifteen-year-olds in the current population will fairly predictably start to vote in three years, have children over the next five to twenty-five years, retire in fifty years, and die in sixty-five years. The exact numbers are mushy, of course, because now we are talking human behavior and genetics. Some of those fifteen-

year-olds, exercising "choice," will already have had children; some, mostly male, will have children when they're sixty. Some will never vote. Nevertheless, put enough of us together, and our collective behavior is predictable enough for insurance companies to make a lot of money betting on it.

As Schumacher also said, "...most people, most of the time, make no use of their freedom and act purely mechanically....When we are dealing with

large numbers of people many aspects of their behaviour are indeed predictable; for out of a large number, at any one time only a tiny minority are using their power of freedom, and they often do not significantly affect the total outcome."

System dynamicists boil down the difference between predictability and choice to some simple rules of thumb:

- *The larger the aggregation* (of people, nuclear power plants, trees, whatever), the more predictability.

- *In the short term*, while infrastructure facilities remain in place, while pipelines under construction or materials in transit discharge their contents, while people age, while trees grow, while existing pollutants work their way out of the groundwater or the bottom mud, a great deal (but not everything) cannot be changed and therefore *can* be predicted.

- *In the long term*, almost everything can change. Infrastructure facilities may have been replaced (solar-powered? informed by whole-system thinking?). There may be a new generation of people (with new mindsets and cultures?) and trees (tightly-controlled plantations? a slow ecological return to whatever nature chooses?). Therefore, not much can be *predicted*, but a great deal can be chosen.

- *In the middle term*, there is a messy combination of predictability and choice.

The actual duration of the "short," "middle," and "long" term depends on the average turnover rates of materials in the system under discussion. Turnover rates are orders of magnitude different between mayflies and mountains, between computers and cathedrals, between easily degraded and recycled pollutants such as human sewage and nearly immortal pollutants such as PCBs, CFCs, and plutonium. It is often, but not always, true that entities that operate with similar constants-in-time (such as lifetimes in years or decades) interact more strongly with each other than with entities having wildly different time constants (lifetimes in nanoseconds, say, or centuries or millennia). Some of the biggest unpredictabilities come, however, when that rule is broken. A new virus hits a hitherto-unexposed human population. Emissions from the industrial economy start turning the ponderous flywheels of the global climate. All hell breaks loose.

The information realm is usually more fluid than the physical realm, more open to choice, less predictable. But even within this realm, there are some useful guidelines for sorting out the predictable from the choosable. Garrett Hardin laid out some of them once in a clever essay about three kinds of truth:

A vision articulates a future  
that someone deeply wants,  
and does it so clearly and  
compellingly that it summons  
up the energy, agreement,  
sympathy, political will,  
creativity, resources, or  
whatever to make that  
future happen. It is a  
Truth-by-Repetition  
Truth, but of a special,  
powerful kind.



- **Always-True Truth:** *This truth remains true no matter what anyone thinks or says about it.* For example, burning fossil fuels creates carbon dioxide; the carbon dioxide concentration in the atmosphere has increased by more than 30 percent in the last century; global surface temperatures in 1998 were the warmest in recorded history.

- **Truth-by-Repetition Truth:** *This truth is more likely to become true the more you say it.* I can run a marathon; every child wants a Furby for Christmas; the stock market is about to crash; the government can't do anything right; Social Security will go bankrupt. This kind of truth is the stock-in-trade of the public relations people and the politicians. Say it often enough, however absurd it is, and you might be able to gin up enough shared belief to create it as reality. (Unless it violates an Always-True Truth.)

- **Doubt-by-Repetition Truth:** *This truth may become less true the more you say it.* I'm about to sneeze; there will be a surprise attack on Baghdad tomorrow; the stock market is not overextended; I am not an alcoholic; the economy can grow forever. These truths distract attention or reveal secrets or stoke up false confidence or divert action by denying and demoting the kind of thinking that can lead to problem solving. They are often purposeful thought stoppers.

Always-True Truths deal with the physical realm; Truth-by-Repetition and Doubt-by-Repetition Truths deal with the information realm, where what we say can influence the beliefs and behaviors of others and ourselves—these are slithery truths, to be used with great care. Confusing one type with another (for example, trying to make global warming go away by emphatically denying its existence) can be fatal.

I tend to get especially infuriated by the Truth-by-Repetition Truth when it is articulated with absolute certainty, as if it were an Always-True Truth; especially when it purports to tell me what is feasible in human affairs—or, more often, what is infeasible. The US political system will never permit a carbon tax. Or campaign

reform. The global population will reach fourteen billion. Half the species on earth will go extinct in the coming century. There will be runaway climate change.

These are not only predictions, they border on self-fulfilling prophecies. They sweep away the possibility of choice, though there is in fact plenty of latitude for choice. They aren't based on physical impossibilities, they are based on the speaker's limited imagination about political or social possibilities. And of course they are a direct invitation to inaction. Well, if it's hopeless, why try? Let's just sit around and wait for disaster.

When I hear statements like these, I'm tempted to ask whether that's the future the speaker WANTS. That question is usually brushed away. The future isn't about wanting. It's about battering down the hatches, preparing for the worst, not getting your hopes up. The surest way to disaster is to declare it inevitable, do nothing to prevent it, and mock and demoralize anyone who tries.

## Vision

Which brings me to my favorite approach to the future: vision. Joseph Smith declaring "This is the place." Babe Ruth pointing to the outfield stands and plunking a home run just there. John Kennedy asserting that there will be a man on the moon within a decade. Martin Luther King's dream of a future in which his four children would be judged not by the color of their skin, but by the



content of their characters. Mikhail Gorbachev ripping away the straitjacket of Soviet thinking and announcing *perestroika*.

Visionary statements and actions come from a completely different place in the human psyche from predictions, forecasts, scenarios, or cynical, downer assertions of political impossibility. They come from commitment, responsibility, confi-

dence, values, longing, love, treasured dreams, our innate sense of what is right and good. A vision articulates a future that someone deeply wants, and does it so clearly and compellingly that it summons up the energy, agreement, sympathy, political will, creativity, resources, or whatever to make that future happen. It is a Truth-by-Repetition Truth, but of a special, powerful kind.

I know that the very topic of vision instantly pushes a warning button in most of us, so I need to stop here for a definition. I am only interested in RESPONSIBLE visions, by which I mean statements about the future that:

1. State how someone actually wants it to be—no mushy concessions to assumed political feasibility, no settling for something less;
2. Violate no Always-True Truths (break no physical laws); and
3. Express desires and values that are widely shared (break no moral laws).

We tend to distrust visionaries, because we have such bad experience with irresponsible ones. Hitler's vision was morally irresponsible. Nixon's vision of energy independence was physically irresponsible. Bill Clinton's vision of a future health care system was half-assed, laced through with concessions to political infighters—not really what he or anyone else wanted, just what he was willing to settle for, so uninspiring it was not worth fighting for.

Another reason we are uncomfortable in the realm of vision is that, if it's a vision that truly moves us, one we deeply share, we're afraid of disappointment. The visionary automatically puts himself or herself on the line; commits to something that hasn't happened yet; takes a visible stand. That kind of action brings up fear. What if it doesn't come off? Then not only will that vision look foolish, ALL visions will look foolish.

It's much safer to mire ourselves in cynicism. We'll never look foolish.

I'm an  
interactivist,  
a visionary,  
a learner,  
a radical.  
I don't run  
scenarios; I  
articulate  
visions.

## A Futurist? OK. What Species? When?

If you can stand one more categorization of ways of thinking about the future, here's one from Russell Ackoff (*Redesigning the Future: a Systems Approach to Societal Problems*, Wiley-Interscience, 1974) that has stuck in my brain ever since I first read it:

Inactivists are satisfied with the way things are. They believe that any intervention in the course of events is unlikely to improve things and is very likely to make them worse. Inactivists work hard to keep changes from being made. Inactivists have a greater fear of doing something that does not have to be done (errors of commission) than of not doing something that should be done (errors of omission).

Reactivists prefer a previous state to the one they are in. They believe things are going from bad to worse. Hence they not only resist change; they try to unmake previous changes and return to where they once were. Reactivists dislike complexity and try to avoid dealing with it. They reduce complex messes to simple problems that have simple solutions—solutions that are “tried and true.” They are panacea-prone problem solvers, not planners looking into the future. They try to recreate the past by undoing the mess they believe the planning of others has wrought.

Preactivists believe that the future will be better than the present or the past, how much better depending on how well they get ready for it. Thus they attempt to predict and prepare. They want more than survival—they want to grow, excel, become better, bigger, more affluent, more powerful, more many things. Preactivists are preoccupied with forecasts, projections, and every other way of obtaining glimpses into the future. They believe the future is essentially uncontrollable, but they can control its effects on them. They plan FOR the future; they do not PLAN THE FUTURE. They seek neither to ride with the tide nor to turn it backward, but to ride in front of it and get to where it is going before it does. That way they can take advantage of new opportunities before others get to them.

Interactivists are not willing to settle for the current state or to return to the past or to get to the future ahead of everyone else. They want to design a desirable future and invent ways of bringing it about. They try to PREVENT, not merely prepare for, threats and to CREATE, not merely exploit, opportunities. Interactivists seek self-development, self-realization, self-control; an increased ability to design their own

destinies. They are not satisfiers, not optimizers, but idealizers. To them the formulation of ideals and visions are not empty exercises in utopianism, but necessary steps in setting the direction for development. Interactivists are radicals; they try to change the foundations as well as the superstructure of society, institutions, and organizations. They desire not to resist, ride with, nor ride ahead of the tide; they try to redirect it.

Well, it's obvious that both Ackoff and I are biased in the interactive direction. but Ackoff was actually making the point that all four of these approaches to the future can be appropriate in different situations, and that all of us can and do play all these roles from time to time. When it comes to seeds for my garden, I'm an inactivist—I already have great varieties and know how to grow them; I resist purple beans and super-sweet corn and bio-engineered potatoes. When it comes to nuclear power or the global economy, I'm a reactivist—I wish I could roll back the clock. Like many farmers, I'm preactive about the weather, tuning into the forecasts many times a day, always peering at the western sky from which the weather comes, trying to transplant just before the rain and harvest just before the frost.

But for most activities in my life, and in all my efforts to help bring about a sustainable society, I'm an interactivist, a visionary, a learner, a radical. I don't run scenarios; I articulate visions. I see no reason why there can't be a carbon tax—or even better a strong, inviolable carbon emission quota—if it will stave off climate disaster. I'm not willing to believe that we can't reclaim our democracy from the moneyed special interests. What's

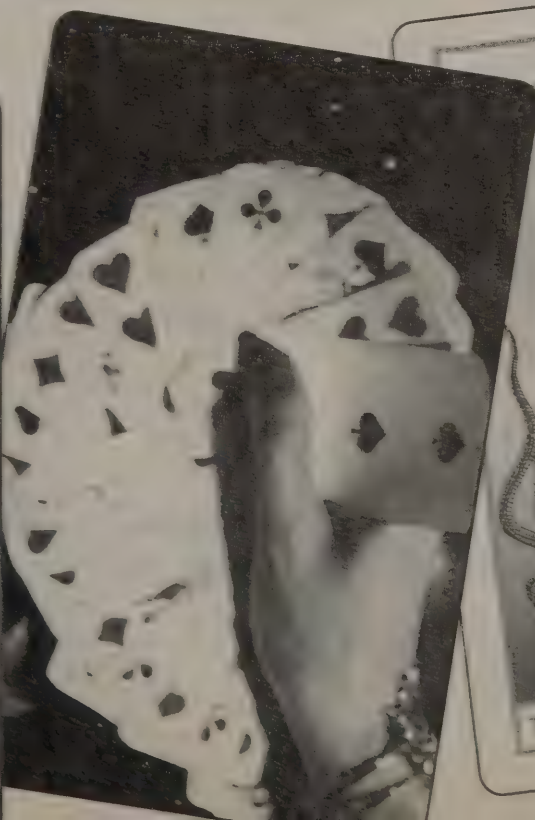
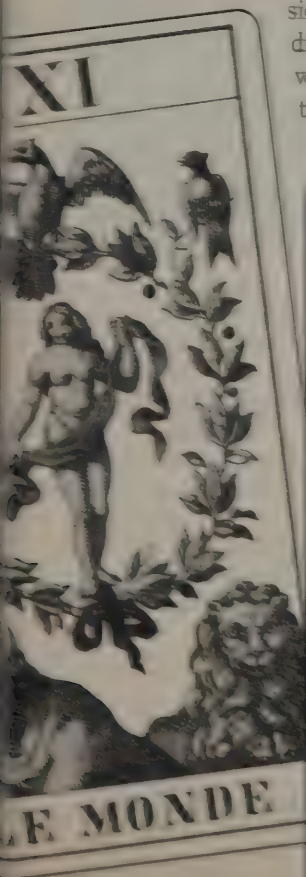
to stop us, other than our own timidity? We don't have to bring fourteen billion people into the world unless we choose to; we could switch to solar power just as fast as the turnover times of our existing capital plant allow; we could return half the planet to nature and create good, sufficient, joyful lives for ourselves from the other half. Why not? Really, why not?

What a huge difference it makes in world view, in empowerment, in responsibility, in self-identity, in the qualities of imagination and courage we draw forth from ourselves, if we think of the future as something not to be predicted, but to be chosen! If we throw off that ancient remorseless myth that we will always choose foolishly!

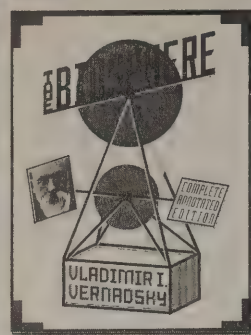
There are real wolves out there. I happen to believe my computer model when it says that the End-Of-The-World-As-We-Know-It is not only a possibility, but a high probability. As the Chinese proverb says, "If you don't change direction, you will end up where you are headed." I think we are headed for disaster. But that thought does not thrill me. And it does not panic me into trying to fashion a world so controlled that it is actually predictable. Rather it energizes me to work toward a vision of a World-That-Works-For-Everyone, including all the nonhuman Everyones, a world in which eight billion people (or preferably fewer) maintain a European standard of living in a way that does not undermine the resource base. a world that evolves and learns and dances and operates from generosity and joy.

The worst wolves, really, are the imaginary ones inside our own heads. ☹

Donella Meadows has contributed so much to Whole Earth that we've made her a contributing editor. Her biography can be found in Whole Earth Nos. 95 and 91.



## UPDATES



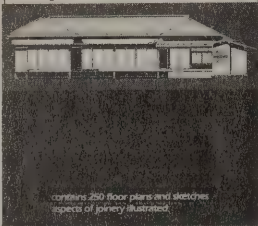
### THE BIOSPHERE Complete Annotated Edition

Vladimir I. Vernadsky. 1998; 192 pp. \$30. Copernicus/Springer-Verlag.

This is the first complete translation of the book, first published in 1926, that established the concept of the Biosphere and the idea that life had changed the geology, atmosphere, and waters of the planet. As important as Darwin. The NASA Earth image of a self-contained sphere originates here. Vernadsky was the greatest Soviet scientist, unknown to us only because of the Cold War. —PW

Heino Engel

### Measure and Construction of the Japanese House



### MEASURE AND CONSTRUCTION OF THE JAPANESE HOUSE

Heino Engel. 1985; 149 pp. \$21.95. Charles E. Tuttle Company.

Heino Engel's classic 1964 book, *Japanese House: a Tradition for Contemporary Architecture* (1968 *Whole Earth Catalog* and *Whole Earth No. 95*) is still out of print. Our thanks to reader

Jacob J. L. Dickinson, who put us onto this edition, which reprints the first two chapters of the original. *Measure and Construction* focuses on

how the Japanese house is laid out, dimensioned, and pieced together. It emphasizes the

external, physical features of the house, without the larger book's efforts to understand the full historical and cultural environment that gave birth to the architecture. This book takes a different tack: utilizing the Japanese achievement as an inspiration for modern living and building, outside the setting in which it developed. —MKS

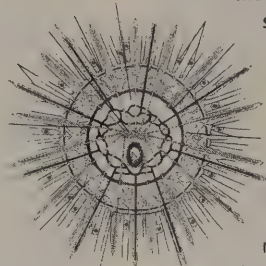
### FIVE KINGDOMS An Illustrated Guide to the Phyla of Life on Earth

Lynn Margulis, Karlene V. Schwartz, and Stephen Jay Gould. 1998; 448 pp. \$29.95. W.H. Freeman.



This new edition updates Lynn's persistent brilliance in rearranging new work on the microcosmos into the most biologically rational framework. It is clearly written, beautifully illustrated, and includes

the new understanding of symbiosis being as important as competition. How will we escape the plant/animal or plant/animal/fungi limitation and add the two new kingdoms, protocista, and bacteria? Protocista definitely needs a sexier name. —PW



### COMMON COURTESY In Which Miss Manners Solves the Problem That Baffled Mr. Jefferson

Judith Martin. 1996; 70 pp. \$15.95. The Akadine Press, Inc., 141 Tompkins Avenue, Pleasantville, NY 10570, 800/823-7323, 914/747-0777, www.commonreader.com.

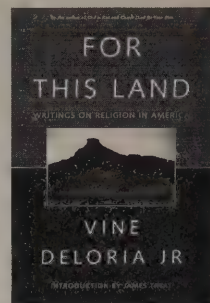
In *Whole Earth No. 95*, we excerpted from Judith's Martin's wonderful essay, *Common Courtesy*, and bemoaned the fact that it had slipped out of print. Bemoan and ye shall receive. Our complaint was scarcely out the door when reader George Wallace wrote to tell us that the good people at Akadine Press had resuscitated the book in a new edition. Thanks, George. Thanks, Akadine. Now go buy the book. —MKS



### FOR THIS LAND Writing on Religion in America

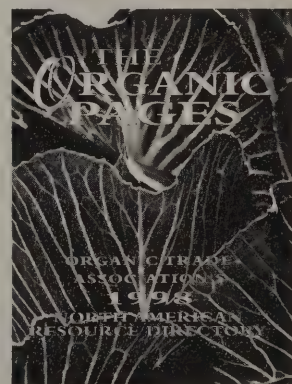
Vine Deloria, Jr. 1999; 311 pp. \$19.99. Routledge.

*For This Land* surveys thirty years' of Vine Deloria's meditations and jeremiads on religion in America. Deloria (see *Whole Earth No. 95*) is often recognized primarily for his legal and historical writing, beginning with *Custer Died for Your Sins*. He began his graduate study at a Lutheran seminary, though, and has closely tracked the role of religion in American life, especially as he has moved away from Christianity and toward articulation of an organic, land-based faith. *For this Land* reveals the range of his voices; he is by turns prophetic, angry, funny, discouraged, hopeful, and always incisive. —MKS

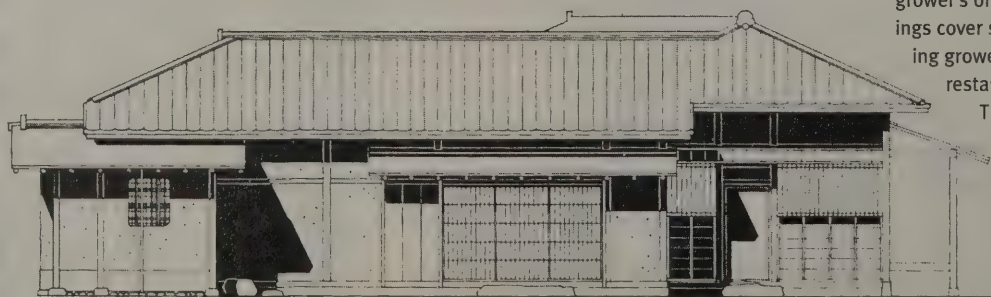


### 1998 ORGANIC PAGES

1998; 270 pp. \$44.95 (\$50.95 postpaid), free to OTA members. Organic Trade Association, PO Box 1078, 50 Miles Street, Greenfield, MA 01302, 413/774-7511, fax 413/774-6432, ota@igc.apc.org, www.ota.com.



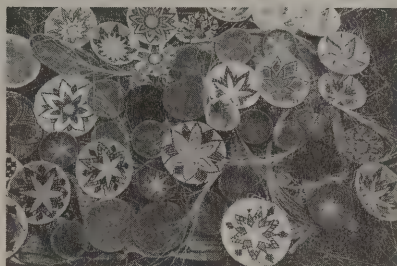
The business association for the organic industry (*Whole Earth No. 92*) in the US, Canada, and Mexico publishes this directory each July. OTA offers a free listing to all certified organic growers, noting which independent certifier has confirmed the grower's organic status. Alphabetical listings cover sixteen industry sectors, including growers, brokers, distributors, restaurants, retailers, and suppliers. The index cross-lists according to specific products and services.





**CRAFTS NEWS**

\$35/yr (4 issues). The Crafts Center, 1001 Connecticut Avenue, N.W., Washington, DC 20036, 202/728-9603, fax 202/296-2452, info@craftscenter.org, www.craftscenter.org.

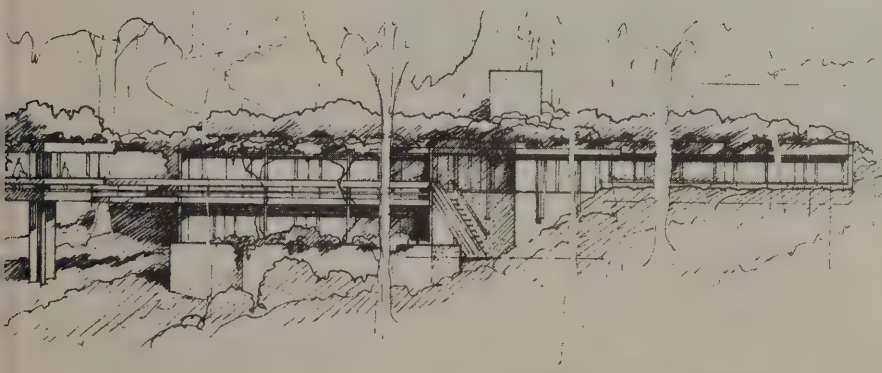


**THE EARTH-SHELTERED HOUSE**  
An Architect's Sketchbook

Malcolm Wells. 1998; 192 pp. \$24.95 (\$30.95 postpaid). Chelsea Green Publishing Co., 205 Gates Briggs Building, PO Box 428, White River Junction, VT 05001, 800/639-4099, 802/295-6300, www.chelseagreen.com.

Whole Earth readers already know our great affection and respect for architect/artist/humorist/underground-evangelist Malcolm Wells. Now, in time for our soil issue, Chelsea Green has reprinted Malcolm's lovely and provocative 1990 book, *An Architect's Sketchbook of Underground Buildings* (WER No. 69). May this new issue find the wide audience it deserves. Special to readers: while they last, you can still get the original for about half the price directly from Malcolm himself (PO Box 1149, Brewster, MA 02631, 508/896-6850). —MKS

The Crafts Center helps low-income artisans around the world (see Whole Earth No. 94) increase access to markets and resources while encouraging crafts production that respects fair trade and labor, cultural traditions, and the environment. It serves as an information clearinghouse, linking artisans to buyers and assistance organizations. *Crafts News* reviews publications, lists upcoming events, and covers trade news, market trends, microcredit programs, and issues such as child labor in crafts production and NAFTA's consequences for artisans.



**SIERRAPINE LIMITED FIBERBOARD**

2151 Professional Drive, Suite 200, Roseville, CA 95661, 916/772-3422, fax 916/772-3415, www.sierrapine.com.

SierraPine has introduced the first line of formaldehyde-free medium-density fiberboard products (see fibers, Whole Earth No. 90). Products in the line, Medex, Medite II, and Medite FR, use a polyurea resin matrix adhesive which adds no formaldehyde (though not stopping off-gassing from natural formaldehydes contained in wood).

**NEWS**

**DRINKABLE NY WATER**

The Environmental Defense Fund announced that the US Department of Agriculture has approved a program proposed by New York City, with EDF help, to protect the quality of drinking water supply reservoirs (see "Can We Drink the Water We Live With?" Whole Earth No. 93). According to EDF, the Conservation Reserve Enhancement Program will use federal and city funds to pay Catskills-area farmers to

fence cattle out of streams and recreate 5,000 acres of forest-and-grass buffer areas around streams that flow into city reservoirs. The buffers will help filter excess phosphorus and possible disease-bearing organisms from farm runoff before it reaches the reservoirs. City officials hope these measures will help make it unnecessary to spend billions of dollars on a water filtration plant.

**DAM BREACHING**

(See "Deconstruction that Improves Your Life," Whole Earth No. 93). The *Seattle Daily Journal of Commerce* reported in December that a group of scientists studying the feasibility of breaching four federally owned dams on the lower Snake River had concluded that allowing the river to flow unimpeded would improve the chances of restoring threatened and endangered fish populations by a 2 to 1 margin compared with the alternative of ferrying fish around the dams. A spokesperson for the Army Corps of Engineers told the *DJC* that this study is but one of twenty-two segments of a report the National Marine Fisheries Service will send to Congress next year.

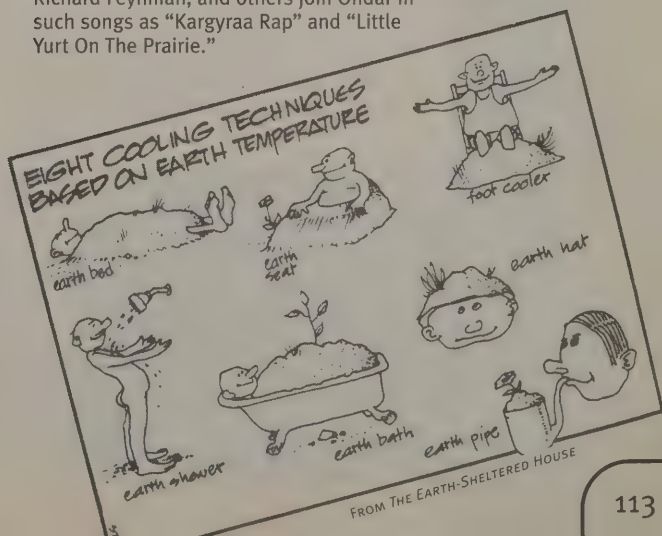
**TUVAN INDIANS**

New evidence from blood studies has shown that the Tuvan throat singers (Whole Earth No. 90) are more closely related to Athabaskan Native Americans than are any other human population. Other anthropological and linguistic studies have connected Athabaskan (Apache, Navajo, Yellow Knife) to a series of languages on the Tibetan Plateau. In addition, the internal organization of both the yurt and the hogan (traditional Navajo dwelling) appears to have maintained remarkable similarities.

**BACK TIVA FUTURE**

Ondar. 1999; \$16.99. Warner Bros.

The latest CD from Kongar-ol Ondar, throat singer extraordinaire and ambassador for Tuvan music and culture. Willie Nelson, Randy Scruggs, Richard Feynman, and others join Ondar in such songs as "Kargyraa Rap" and "Little Yurt On The Prairie."



GOSSIP



Whole Earth has interns galore. From left to right: Kim Magraw, Amie Clute, and Kate Waffner. They generously give, easily learn the nitty-gritty of Whole Earth, which you may have noticed is one of the more complex magazines around, with incredible amounts of access that needs to be verified, hard-to-find images requiring hard-to-obtain permission, and hard-to-research topics. The low number of corrections is a compliment to their skills.

Immediate left: We welcome Nicole Parizeau, our new assistant editor.

Our anniversary issue caused a bit of a stir. Some readers loved its history and heart; some found it sloppy and indulgent. We can't afford market surveys, but youngards (twenty to thirty) fessed that they assumed the 1960s/1970s Whole Earth had been the product of out-of-it and stargazer back-to-the-landers. On seeing the re-issue, they kept saying, "I didn't know you were into *that*" ...be it Clarke's boots or the first \$4,000 desktop calculator. The anniversary issue caused a subtle shift, and with it (what I had hoped for but could never have guessed), an embryological respect for the good works of the older generation.

On the other hand, many folks who have been with us for years preferred the essays. Each had different favorites. The essays, especially Jerry Mander's, sparked much dinner-table chat. I thought of my time in Mali when kids brought home drawings of hyenas, and their grandparents began, for the first time, to tell stories about hyenas that had actually roamed through the villages twenty years before. Two times, re-linked.

Reproducing the 1968 Catalog was a gutsy workout, improvisational funk. The original Catalog

resembled today's 'zines, a cut-and-paste job, the product of enthusiasm and trail breaking, not classical design. The Catalog had to be re-created, but the old pages could not be scanned. Too yellow, too little contrast. Any piece of a page that *had* to be scanned (because we could find no other source) fuzzed like a fax.

But design mavens Stephanie and Monika never caved and cheerfully ad libbed. Double-clutchin' Robin O'Donnell retyped as much text as possible, and the designers set it in the font closest to the original! We bird-dogged as many old covers as time allowed and re-scanned and replaced them. But who could find *Tensile Structures, Volume 2?* the *Explorers Trademark Log?* the original cover of *The Teachings of Don Juan?* or the long-gone Klondike Enterprises's Alaskan mill? Some would say the repro surpasses the first edition.

NEWS

Stanford University just bought Whole Earth's archives, including a few boxes from all previous editors. Our archives join the papers of Allen Ginsberg, Stewart Brand, and many more. It

wasn't as much as you might imagine, as we had returned all originals (like Crumb drawings) to the artists and not all previous editors were maniacal pack rats. Tomas Jaehn, Curator for American and British History at the Cecil H. Green Library, had to deal with all the rogue and scattered stuff. But we did pull together a complete set of all our publications. The Black Panther issue of CoEvolution Quarterly appears to be the rarest gem. All of this occurred because Mike Ashenfelder retrieved and harbored catalogs and random findings when Whole Earth suspended publishing in 1996. Amazing foresight and care. *Gracias*. We will continue to add to the collection and will receive about \$9,000 to help us survive.

Nicole Parizeau joined WE as our new assistant editor. Lyssa Mudd scampered off to India to be with her teacher before going to graduate school. Born in Pátzcuaro (Mexico), raised in Montreal, and bi-coastal American (Virginia/California), Nicole's been a writer, river rafter, sky diver, and autocrosser (technical speed driver on maze-tracks). She's our third staff Canadian (with Alex and Stephanie), but from the French side. We've never been better organized or more knowledgeable about how the, as it were, Commonwealth speaks. Nicole's jokesmithing definitely has brightened the fog of excessive sincerity that catsteps into all "so serious" organizations. —PW

lori Tabata and Sarah Okabe stopped by from Yamano Furusato Mura Visitor Center in Japan, where lori is a park ranger. They were here for a National Park Service week that brought together park rangers to exchange and learn about the environment and education. Yamano Furusato Mura sits by a lake outside Tokyo and offers pottery, stonework, bamboo, natural/traditional food, and nature walks. They brought greetings from a WE friend, poet Nanao Sakaki, and a gift of a green-and-white banner from the group struggling to save the Nagara River. From left to right, in old style calligraphy, it says Blue (from the color at a distance) Mountains, Clear Running Waters, Our Home.



Whole Earth is a conversation. Compliments, cavils, and corrections are welcome. Letters and email may be (reluctantly) edited for space.

### BIG SKY, SECOND THOUGHTS

I am an avid reader of your journal. As a landscape photographer living and working in Western Montana, I found your recent issue on "Modern Landscape Ecology" [Summer '98] particularly interesting.

I have increasingly begun to wonder if, in my role as a landscape photographer, I am not colluding with the development interests which, I believe, are rapidly destroying Western Montana. Every time I frame out a road, fence or house in my beautiful photographs of "nature," am I not contributing to the myth of Montana as the "Last Best Place" and thereby hastening its destruction by encouraging more people to move here? I wouldn't be so concerned if Montanans had learned from the experience of California; I watched that beautiful, arid landscape disappear under asphalt and concrete. Unplanned growth is rapidly destroying the Montana landscape.

I have enclosed a photograph of what may be a more accurate depiction of Montana's emerging landscape. It was taken in Polson, across the street from beautiful Flathead Lake, now ringed by housing developments, vacation rentals and camps and traversed by the horribly ubiquitous jet ski.

Keep up your good work!  
Sincerely,  
Richard Paup  
Hamilton, Montana

### MIXED REVIEWS

Mostly, over the last 29 years, I've found the various manifestations and incarnations of WE, although sometimes upsetting or otherwise less than pleasant, at least always well worthwhile. And even more important, worth the paper (trees). My reference collection goes back to fall '69 and numbers 98 items, so you see it is not with any casual interest that I now presume to

censure the winter '98 issue. The mildly pleasant nostalgia induced leafing through it, when it came, quickly yielded to annoyance at the poor print and picture quality and I didn't stay with it for long. Usually I can't be pried loose for at least several hours when a new issue arrives.



That night it came to me that there was really no point in rePRINTing (and badly) the '68 WEC, especially in that awkward size. Yes, I know it was true to the original—so?? It seemed lazy, thoughtless, and profligate—but no doubt at eight bucks a shot y'all will make money...is that the endgame?

All these years I've naively thought that "we" (the concerned and striving to become more aware) were trying to improve our role on Earth. So what gives?

Sincerely, Adam Turtle  
Concerned Citizen  
Summertown, Tennessee  
Planet Earth



I just received the "30th Anniversary Celebration" issue. It is beautiful, a treasure chest of wisdom and insight

from the past combined with hope for the future.

Wedding the two issues was just the thing to do. Congratulations and all good things in the New Year!

Victoria Shoemaker  
Berkeley, California

### BLOODY COMMONS

I had just come back from Chiapas when I found your magazine at home; what a great surprise it was to read your article, "The Flourishing of the Commons" [Fall '98]!

In Mexico the commons are still alive, a reality here and now, a living experience for hundreds of *campesinos* who depend on them for their survival. The challenge for those of us who have the privilege to write about the commons is how to act so as to empower the "honest realists" struggling every day to reclaim the right of every human to lead a life out of modernized poverty. In Mexico the question is not so much to develop the potentialities of intelligence, grace and freedom in people, as your article states; these have never ceased to be present and flourish in spite of the perversion of capitalist and neoliberal interests. Rather there is an immediate need to get rid of the daily deadly violence that prevents people to exercise fully their right to decide on their own destiny!

In 1991, in order to favour the privatization of the land and the interests of transnationals, Article 27 of the Mexican Constitution was amended. Until then, this article had granted the "*campesinos*" the right to own communal land respecting their traditional decision-making bodies and a certain autonomy....

In Mexico, reconquering the commons means a threat to national and transnational powerful interests. This automatically puts your life at risk. Due to the pervasive repression of the government, international support is highly valuable. US citizens are demonstrating against the School of the Americas

where our military are being trained. Italians have been deported for denouncing indigenous massacres in Chiapas. Maybe you would like to share our story with your readers and support here and now our struggle to keep the commons.

Patricia Hume  
Centro de Education Mundial  
LANETA  
Alberto Zamora 126  
Coyoacán 04100  
Mexico DF  
cgemex@laneta.apc.org

## HOLLOW EARTH

I am curious to know if you or anyone in the staff is considering an issue, or even an article, covering the hollow interior of the earth. 1999 marks the 30-year commemorative anniversary of Dr. Raymond Bernard's: "The Hollow Earth," a classic book worth tributing.

Our government tries to pass it off as "theory" and "fiction" in their attempts to suppress. But numerous foreign sources don't hesitate to stand up for the truth about the earth's hollow interior and the "cen-

tral sun." The proof is there. Your reply will be appreciated and welcome. Thank you.

Yours Truly,  
Vernon McVety Jr.  
Rochester, Michigan

## CONTRIBUTORS' GUIDELINES

More details at  
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Send submissions to Whole Earth, 1408 Mission Avenue, San Rafael, CA 94901; fax 415/256-2808; email: [editorial@wholeearthmag.com](mailto:editorial@wholeearthmag.com).

## ISSUE 96 THANKS

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Chuck Thomas (Marijuana Policy Project)  
Mark Troyer (Whole Earth subscriber)  
Marta Ulvaeus (NJ Institute of Technology)  
Catherine Varker (Alfred A. Knopf)

### CORRECTIONS

We apologize to the Bioneers for a mistake in their URL (Whole Earth No. 95, p. 32). The correct URL is [www.bioneers.org](http://www.bioneers.org).

Our review of the Dynadiggr (Whole Earth No. 94, p. 105) featured a misspelling of the product's name, for which we apologize.

The current address for Volunteers in Technical Assistance (Whole Earth No. 95, p. 62) is 1600 Wilson Boulevard, Suite 710, Arlington, VA 22209.

From Robert Weber: "Although I appreciate Donella Meadows presenting a portion of my work on cultural cycles and their relationship to the Long Wave [Summer '98], I'm obliged to point out that this research was undertaken in active collaboration with the late J. Zvi Namenwirth, formerly in the Department of Sociology at the University of Connecticut. His research, based on a content analysis of party platforms in American presidential campaigns from 1844 to 1964, first identified the 50-year cultural cycle. My work extended Namenwirth's findings to Britain. See *Dynamics of Culture* (Allen & Unwin, 1987)."



# Announcing the Margaret Mead 2001 Awards recognizing community creativity for a new century

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If you know of a small group (fewer than 100 people) anywhere on the planet that has worked to change the world; that has cross-connected issues such as race, environment, intergenerational learning, child rearing, and gender understanding; that has developed an organization or series of tools that others can learn from; and that takes a long view of cultural understanding, please send your nominations to:

Mead 2001 Awards PO Box 3223 Petersborough, NH 03458 or [nominate@mead2001.org](mailto:nominate@mead2001.org)

**Whole Earth relies on the generous support of its readers and foundations to make ends meet. We gratefully thank all those readers and friends who have given, at any level. (Phone Alex, 415/256-2800, ext. 225, to find out the “perks” offered at each giving level.) In particular, the following people deserve special thanks:**

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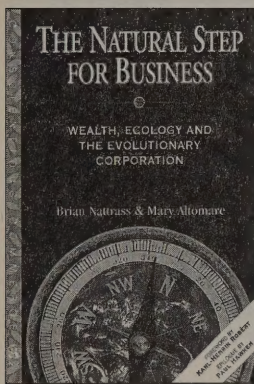
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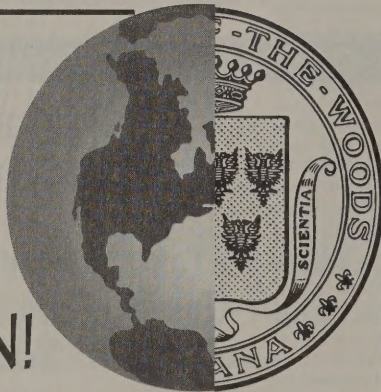
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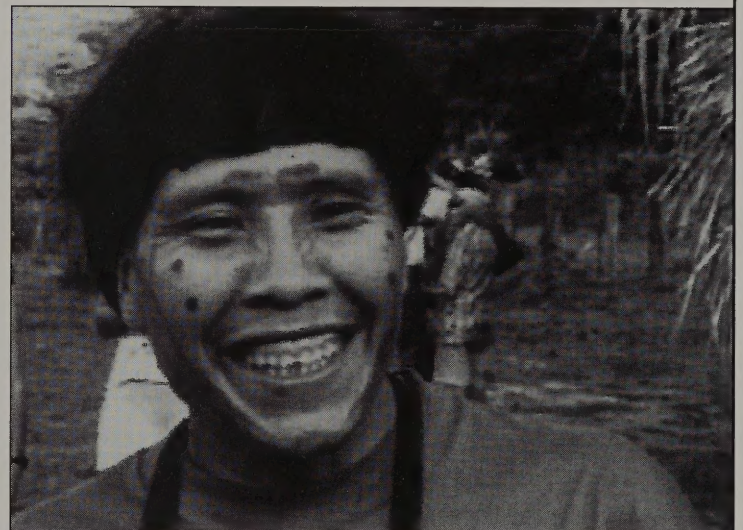
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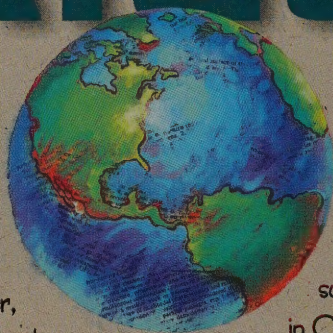
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